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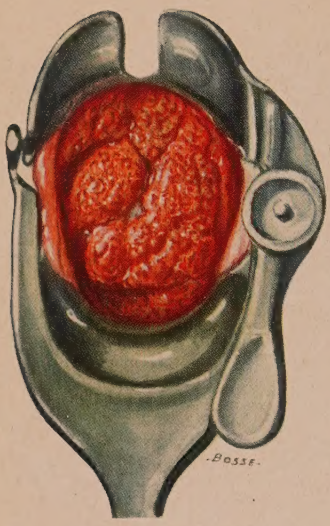

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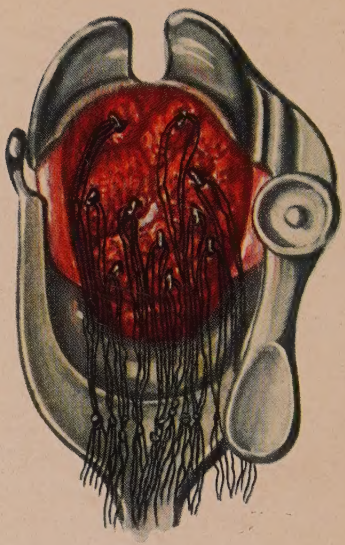

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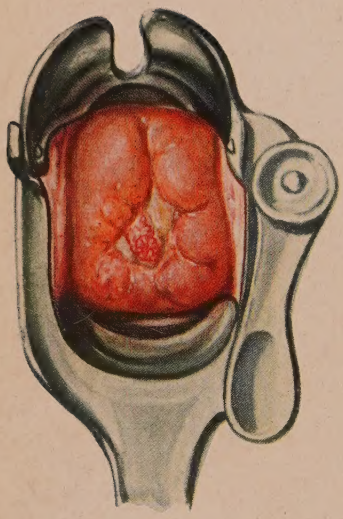

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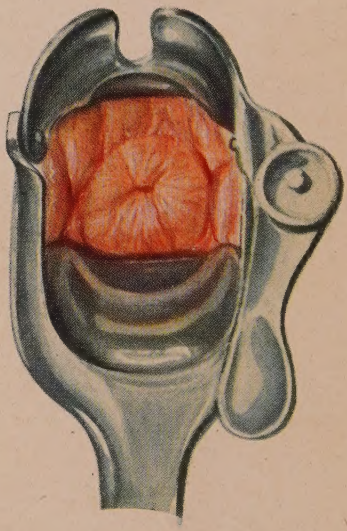

IV

I. Inoperable carcinoma of the cervix before radium treatment.

II. Radium needles applied to inoperable carcinoma of the cervix. The needles are thrust directly into the carcinomatous mass.

III. Inoperable carcinoma of the cervix three weeks after application of radium needles.

IV. Inoperable carcinoma of the cervix; final result after radium treatment.

MEDICAL GYNECOLOGY

BY

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Fourth Edition, Thoroughly Revised

WITH ORIGINAL ILLUSTRATIONS

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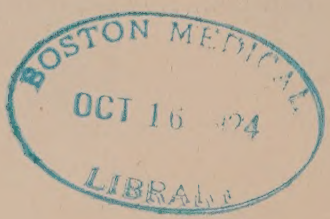

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DEDICATED TO

Hermann St. John Boldt, M. D.,

IN ADMIRATION OF HIS SURGICAL ATTAINMENTS
AND AS A TOKEN OF MY SINCERE
REGARD AND ESTEEM

PREFACE TO FOURTH EDITION

In preparing this, the fourth edition, I have had the valuable assistance of my associate at the Post-Graduate Hospital and the Medical School, Dr. Walter T. Dannreuther. He has contributed the chapter on Urinary conditions, and has done most of the work in the sections on Radium and X-ray, and has been of great assistance in the proof reading.

Dr. George Mannheimer has rewritten the chapter on Constipation and Dr. Walter Highman the chapter on Syphilis. The chapters on the endocrine glands have been rewritten by me. I am in debt for much therein to the writings of Swale Vincent, Langdon Brown, Janney, Marine and Baumann, McCarrison, Slemp and others.

I have tried to give credit to these and other investigators and students of endocrinology, hoping to bring their names and their labors to the attention of those members of the medical profession whose time may permit of special reading. No work should be more appreciated than the laboratory and physiological studies of these scientific benefactors. I regret that space and time have failed me in my desire to present my conception of the true and the false in the so-called Freudian field. The theory of the subconscious has been a huge and valuable contribution to our psychology. The stress laid, originally, on the sex factor and the continued emphasis on this phase have beclouded the main substance and have brought to psychoanalysis and to the interpretation of dreams a coloring and a trend which is to be regretted. I hope to soon see authoritative works, by competent neurologists, which will correctly estimate and scientifically evaluate the relation of all the instincts to the subconscious and the conscious spheres and to neuroses and psychoses. I am certain that we shall throw out unscientific interpretations which pass for elucidations and extensions of the rôle and rule of sex instinct.

S. W. Bandler.

New York City,
July, 1924.

PREFACE TO THE FIRST EDITION

THIS book has been written as a result of frequent inquiries for a work dealing with the non-operative side of gynecology. It represents, with elaborations, a grouping and rearrangement of my clinical lectures. The various topics have been viewed from the standpoints of the symptoms, the disease, the bimanual and microscopic findings, and the general physical and nervous state.

The knowledge gained by studying the diseases of women from these different points of view gives a more distinct mental picture and furnishes logical coördinated conclusions. The resulting repetition and reiteration emphasize important points and make each section fairly complete in itself, thus diminishing as much as possible the necessity of referring to other sections, except for more complete elucidation.

Operative procedures have been viewed as a last resort in those numerous conditions where medical means can accomplish so much. In no field of medicine is conservative treatment of greater value, but, combined with this, there is needed a knowledge of the relation of normal and pathologic genital functions to the general physical and psychic health of woman. I have endeavored to show the relation which pelvic abnormalities really bear to the physical and mental state of the female, in order that we may deal intelligently with gynecologic diseases and not confine our diagnosis and therapeutic methods to the pelvis.

The life and make-up of woman are such that, aside from the diseases and injuries to which she is liable, physiologic processes, heredity, predisposition, mental perturbation, the emotions, marital relations, etc., have an important bearing, and, therefore, the physician who enters into a study of these factors becomes a far better judge of the meaning of symptoms.

I have consulted particularly the writings of Kisch (puberty), Joseph (syphilis and gonorrhea), Bumm, Wertheim and Finger (gonorrhea), Oskar Frankl (electricity and hydrotherapy). To the teachings and writings of Winter must be credited much of the advance in matters relating to diagnosis and to carcinoma. I gladly record my especial obligation to him for much that has aided me these past twelve years and, consequently, for much that appears in these pages.

The chapter on Constipation, written by my friend, Dr. Geo. Mannheimer, is in complete harmony with the views expressed in other sections, and the value of its teachings must be self-evident. I am indebted to Prof. H. T. Brooks, of the Post-Graduate Medical School, for valuable opinions and information which were given to me while writing the section on Gonorrhea. Dr. I. Strauss revised the pages on bacteriologic methods. I am indebted to Dr. I. Strauss and to Dr. S. Philip Goodhart for suggestions in the section on Associated Nervous Conditions. Dr. Leopold Jaches, of the department of photography, Cornell Medical School, has been of invaluable aid to me in photographing instruments, apparatus and therapeutic procedures on the patient. Mr. K. K. Bosse has made the drawings and illustrations in his well-known accurate and artistic manner. I wish to express my thanks to the publishers, and particularly to the vice-president, Mr. R. W. Greene, for hearty support and assistance in the many details connected with the publication of this book.

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MEDICAL GYNECOLOGY

GYNECOLOGIC EXAMINATION

HISTORY TAKING

In gynecology an accurate diagnosis depends upon a thorough itemization and correct interpretation of the symptom-complex in the basic anamnesis, as well as upon reliable laboratory findings and the objective evidence obtained by the physical examination. The interrogation of the patient is too often carried out in a more or less aimless manner, perhaps without any definite purpose in mind or real comprehension of the significance of the information secured from the patient.

A certain definite order should be followed in taking a gynecologic history, to obtain information concerning the patient's physical condition, but more particularly to learn of those important factors which play their rôle in the pelvis and those general states which are so profoundly influenced by normal or pathologic pelvic processes. It must not be forgotten that a woman may misstate her age, assume an alias, and otherwise distort the truth, and all cases involving questions of sterility, early pregnancy, and venereal infections should be viewed with suspicion. The points which are to be held especially in mind in taking a gynecologic history are the cardinal symptoms which bring women to the physician for their special care —amenorrhea, dysmenorrhea, menorrhagia, metrorrhagia, leukorrhea, pruritus vulvæ, pelvic pain and backache, sterility, dysuria or frequent micturition, nervous annoyances.

Age.

If *married*, how long?

If *parous*, how many children; when; the last child; number living; cause of death?

Pregnancies—nausea; vomiting; effect on health; pain during pregnancy?

Labors—duration; instrumental; how long in bed; temperature?

Nursing—how long; duration of amenorrhea, of lactation; influence of nursing on general health?

Abortion—Miscarriage—how many; when; in what months; date of last one; curetted?

Diseases of Childhood—diphtheria; scarlatina; chorea, etc.?

Other diseases—typhoid; chlorosis, etc.?

Establishment of menstruation—when; regular; longest interval; pain before, during, or after; fluid blood or small clots or pieces; amount; duration?

Pain, from the very first menstruation or developing after months or years?

Nervous conditions before or on establishment of menstruation or before each menstruation?

Pre-menstrual symptoms; headache; fullness in pelvis; backache; fullness of breasts; palpitation; restlessness?

Marriage—dysmenorrhea better or worse; acquired; alteration in character of menstruation; leukorrhea or irritation of bladder shortly after marriage; dyspareunia?

Menstruation now—how often; duration; amount; pain before, during, or after; in bed during menstruation; date of last menstruation; duration of amenorrhea if acknowledged; is pregnancy probable?

Pre-menstrual symptoms—begin how long before menstruation; headache; neuralgia; nausea; flushes; palpitation; nervousness, restlessness; backache?

Pre-menstrual and menstrual pelvic pain—abdominal; in ovarian region; in uterine area; bladder; back; coccyx; radiating to hips; down thighs; up to the ribs; how long since noted; related to labor or abortion?

Intermenstrual pain—abdominal; ovarian region; bladder; back; coccyx, worse during menstruation; sense of bearing down or looseness of pelvic organs?

Was there ever an acute onset of pain which confined patient to bed; associated with temperature; loss of blood; duration of attack; diagnosis made at that time?

Urination—frequent; how often; at night; painful; duration of annoyance; ever acute; shortly after marriage; after labor; after abortion; pain in kidney region; pain before, during, or after urination; pain urethral or suprapubic; dysuria or tenesmus?

Leukorrhea—duration; white; yellow; thin; mucoid; odor; associated with burning or urinary annoyance at onset; date of beginning; better; worse?

Pruritus vulvæ—duration; leukorrhea; alterations in skin; thirst; amount of urine passed; weight lost?

Nervous symptoms—languid; tired; mental weariness; depressed; excitable; irritable; cross; cry easily; palpitation; phobias; sleepless, because of pain or flow of thought or worry; mental shocks?

If menopause—how long; came on slowly or suddenly; bleedings increased before ceasing finally; flushes; how often; at night; nervous; sleepless; depressed; excitable; irregular spotting; leukorrhea; disagreeable discharge?

Headache; cough; palpitation; appetite; digestion; character of food; constipation; hemorrhoids; drugs or enemata for constipation?

Family history with especial reference to tuberculosis, diabetes, stigmata of syphilis, and carcinoma?

Gain or loss in weight; increase in size of abdomen?

Careful questions concerning symptoms of syphilis if indicated.

Operations; previous treatments?

Finally—let the patient in a few words define and explain the annoyances and symptoms of which she complains and because of which she comes.

Preliminary to the abdominal and pelvic examination, the physical peculiarities of the patient, pulse rate and rhythm, systolic and distolic blood pressure, condition of the thyroid and cervical lymph nodes, the condition of the lungs, the heart, and the state of the blood should be determined.

EXAMINATION OF THE ABDOMEN

For the gynecologic examination the patient should remove her corset, and should loosen all the bands about the waist. Examination is performed with the patient in the lithotomy position with the knees separated by movable rests, in order to remove any strain upon the abdominal muscles. The bladder should be catheterized, collecting a specimen for macroscopical examination in a long, sterile ignition tube. The excess may be allowed to run into a pus basin. Unless the rectum and sigmoid are empty a thorough examination cannot be made.

The abdomen should be thoroughly examined and percussed and the condition of the abdominal wall, whether elastic or flaccid, should be noted, and the presence of separation of the recti muscles or the existence of a hernia should be looked for.

Painful spots should be noted, particularly in examining the region of the gall-bladder and appendix and the points of Morris (see Head Zones, p. 47). If a line be drawn from the umbilicus to either anterior superior spine of the ilium, a point on each of these lines 1½ inches distant from the umbilicus corresponds to Morris's points. If the appendix alone is involved, the right point will be sensitive and the left point will not, while, if there is pelvic inflammation or marked involvement, both points will be sensitive. The presence or existence of movable or floating kidney on either side must be carefully looked into and the abdomen percussed to determine the existence of splanchnoptosis. Special attention should be directed to the region of the sigmoid, for dulness will be found in a very large number of instances. And the promptness with which many pelvic symptoms disappear after a series of oil and soap suds enemata is sometimes astonishing. The abdomen is thoroughly palpated to determine the existence of a pelvic tumor or of a uterus enlarged by a tumor or by pregnancy, or to determine the presence of the uterus held close to the abdominal wall by a retro-uterine tumor or exudate. The fingers of either hand should press down into the pelvis to determine the existence of abdominal rigidity or to note the production of pain. After the conclusion of the subsequent examination the patient, while in a seated or standing position, should be further examined as to the existence of movable or floating kidneys and to note the outline of the abdomen, especially if gastro-enteroptosis or very loose abdominal walls are present.

The table illustrated in Fig. 1 is of the greatest convenience. With it the patient can be readily elevated into modified degrees of the Trendelenburg position. The legs are supported by movable rests which swing the knees into a comfortable position. Below the surface of the table is a large trough, nearly the full width of the table, which may be drawn out, and which readily catches the fluids poured out from a speculum or from the catheter when irrigating the bladder. The fluid runs down this wide trough into a large round basin placed upon a framework underneath the table.

Lubrication of fingers and instruments in gynecologic examinations:

All mucous membranes are delicate, sensitive, and easily traumatized. It is therefore desirable to apply some material of a slippery character to any foreign body brought in contact

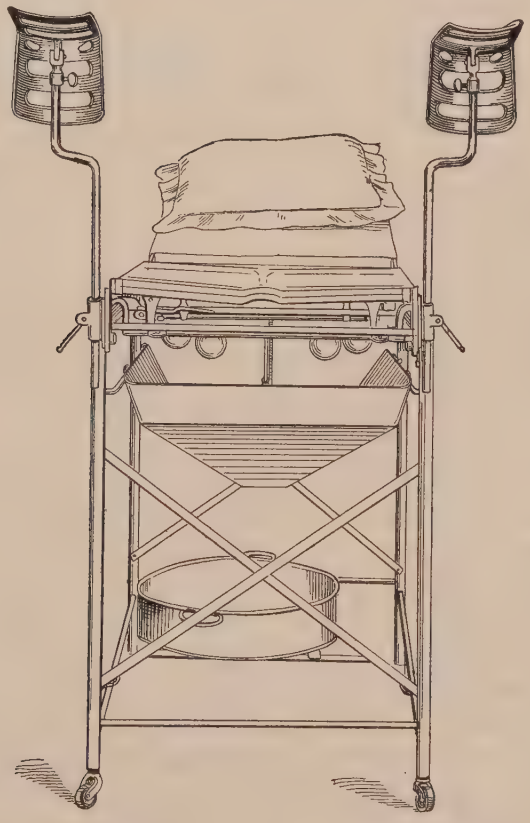

Fig. 1.—Examining table with adjustable movable leg-holders. Underneath is a wide trough which is pulled out during vaginal or bladder therapy and which carries fluids and cotton down to the basin below. A large leather cushion makes the lithotomy position exceedingly comfortable. The upper wing of the table can be raised to any angle. The lower end can be raised, with the patient on it, to a mild Trendelenburg position.

with a mucous surface. A good lubricant is non-greasy, homogeneous in consistency, sterile, slightly antiseptic, non-irritating, and fairly soluble in water. Vaselin is greasy and not soluble in water. Soap-suds do not adhere well to gloves

and metal instruments. Extensive use of the proprietary preparations put up in collapsible tubes is unnecessarily expensive. The following formula makes about 2 gallons of a smooth product, which fulfills all the above requirements:

Irish moss	℥iv
Gum tragacanth	℥viii

Cover generously with cold water and allow to stand for 24 hours, with occasional stirring. Then strain through 2 or 3 layers of gauze. Next mix

Eucalyptol	℥iiss
Formalin (40%)	℥i
Boric acid solution (4%)	℥ii
Glycerin	℥xii

Stir this mixture into the moss and tragacanth base, previously strained, and add sufficient water to make the lubricant of the proper consistency. It may be kept conveniently in Mason fruit jars.

INSPECTION AND PALPATION

Before proceeding with the examination of the vulva and vagina, the physician should don a pair of thin rubber gloves, which have been sterilized by boiling. They interfere very little with the tactile sense, and serve as a protection to both patient and physician. In emergencies, however, rubber finger cots may be used in their stead.

Vulva and Vagina.—The external appearance of the vulva should be noted, and the condition of the skin and the hair-follicles observed. The large and small labia are then separated and the color of the vulva and the character of the mucosa are observed (Fig. 2). The external opening of the urethra is carefully inspected, the vestibule likewise, and redness or accumulations in the periurethral ducts are looked for. In nulliparæ the fourchet is examined, and if there is an accumulation of discharge, it is wiped away by moist cotton sponges, so that the character of this part of the vulva is distinctly visible. The condition of the perineum is observed and the patient is told to press down as if at stool, in order to determine any protrusion of the anterior or posterior vaginal walls. The opening of the

ducts of Bartholin are next examined and flea-bite redness of their outer ends looked for. Pressure is then made on the glands of Bartholin and a smear taken of the secretion. Skene's glands are brought into view, if possible, by separating the lips of the external opening of the urethra, and if a discharge is present a

Fig. 2.—Separation of the labia with the thumb and index-finger is an essential step to clearly disclose the important structures of the vulva and the urethra preliminary to bimanual examination. Careful examination of the vulva and its contained ducts, glands, and openings is of prime importance.

smear is made. The urethra is then massaged and a smear is taken of the secretion. If no secretion is obtained, and if symptoms point to possible involvement of the urethra, a platinum loop or, better still, a small platinum flat spoon sterilized over the flame, gently introduced, scrapes the urethral walls from behind forward (Fig. 3).

After washing the vulva a loop or platinum spoon takes a smear of the vaginal secretion. The external opening of the urethra is gently mopped with a pledget of cotton, moistened

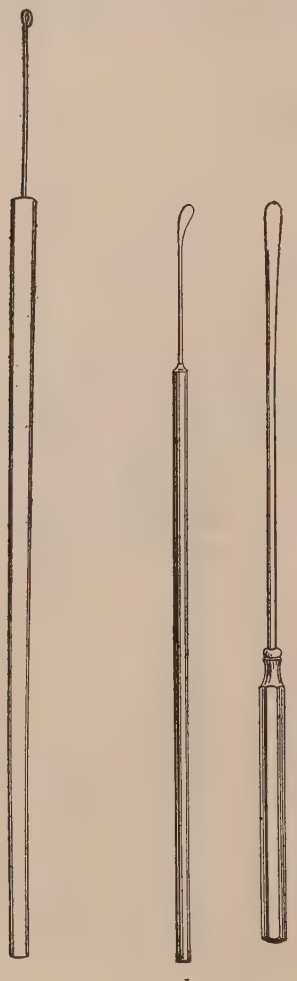

Fig. 3.—*a*, Platinum loop for taking secretion from the urethra, vulvar glands, ducts of Bartholin, vagina, cervix. *b*, Platinum spoon for taking scrapings from the urethra, vulva, vagina, and cervix. *v*, Small spatula for the same purpose.

with boric acid solution and the urine is drawn off by catheter into a sterile glass for examination for albumin, sugar, and

urea determination, microscopic examination of the sediment, and for the possible making of bacterial cultures or guinea-pig inoculations.

The first and second fingers of either hand, preferably the left hand, are dipped in lubricant and introduced into the vagina. They should first note the condition of the levator ani muscles, and their elasticity; the fingers pass down along their lateral border toward the perineum and the degree of their firmness or laceration or flaccidity should be noted. The fingers are next introduced along the vagina, and the heat, smoothness, roughness, and sensitiveness of the vaginal mucosa determined. Lastly, they are introduced into the fornices and the existence of bands or of scars running out from the lateral borders of the cervix are looked for.

The cervix is palpated and the presence or absence of lacerations noted. The size and consistence of the cervix should then be ascertained, and the character of the external os investigated—normal, soft, smooth and velvety, rough or granular, small or large external os; and if large, whether it admits a finger.

Uterus.—The position, consistency, mobility, symmetry, and size of the uterus should then be determined. The index and middle fingers are in the vagina, the thumb is over the clitoris, the two last fingers of the hand are folded upon the palm and make pressure on the perineum (Fig. 4). The elbow of the examining hand rests against the body or on the knee, which is flexed, the foot resting on a stool. The body is inclined forward and pushes the examining hand high up and presses the closed last two fingers against the perineum without any conscious exertion of the arm. The two internal fingers are then turned with their palmar surface upward to discover whether the fundus is in normal anteflexion, or in anteversion, or in pathologic anteflexion. Ofttimes the fundus cannot be felt, even if in normal position, if the bladder has not been emptied.

The external hand presses with the palmar surface of the fingers upon the abdomen between the umbilicus and the symphysis. If the uterus is in anteflexion, it will be felt

between the external and internal fingers, or else the pressure of the external hand will be distinctly felt by the internal fingers, communicated by the body of the uterus (Fig. 5). The character of the anterior uterine wall can then be determined. The

Fig. 4.—Correct position of patient and physician in making bimanual examination. Resting the examining arm on the leg of the same side enables the body, by leaning forward, to push the examining fingers steadily and deeply into the vagina without conscious effort. The index and middle fingers are always introduced into the vagina when possible.

posterior wall of the uterus should be palpated by the external hand and its size, consistence, breadth, and thickness determined. The internal fingers are passed first into one lateral fornix and then into the other. It is often valuable to use the

fingers of the left hand in palpating the patient's left adnexa and the fingers of the right hand in palpating the right adnexa. The fingers are directed towards the lateral fornix and the external hand passes out from the fundus and then a little upward, pressing gently and firmly against the abdominal walls in an effort to bring the tube and ovary between the fingers of the two hands. A normal tube can be felt with difficulty;

Fig. 5 —Position of the examining fingers in the vagina and the finding of the fundus uteri between the internal and external fingers when the uterus is normally flexed and the bladder is empty.

normal ovaries, except in very obese women or women with resistant abdominal walls, can be readily palpated and their size and sensitiveness determined. In some cases, even with normally anteflexed uteri, the tubes and ovaries are descended or prolapsed postero-lateral to the uterus or even into the lateral area of the cul-de-sac of Douglas.

If the uterus is not felt in anteflexion, the internal fingers are introduced into the posterior fornix to determine the existence of

a retroflexion (Fig. 6). The fingers then feel, in the cul-de-sac of Douglas, the fundus of the uterus, and its continuity with the cervix is determined. The adnexa of such a uterus are felt by introducing the examining fingers high up into the posterior fornix, and then palpating laterally toward the lateral pelvic wall. The external hand is relatively of little use in this manipulation, but pressure should be exerted in the lower part of the hypogastric region in order to press the ovaries nearer to the

Fig. 6.—The examining fingers are in the posterior fornix palpating the fundus of a retroflexed uterus and noting the continuation of the cervix into the fundus. In this manipulation the external hand is of little importance.

internal fingers. By deep pressure adnexa situated laterally, even if adherent, can be brought between the external and internal fingers, but many of such adherent tubes and ovaries cannot be palpated if they are adherent to the posterior wall of the broad ligament or to the lateral pelvic wall, or if, as so often happens, they are adherent to and covered by the sigmoid and other peritoneal adhesions. In some cases elevation of the patient into the Trendelenburg position enables such adnexa to be palpated.

If the uterus is not found in anteflexion or retroflexion, it should be sought in retroversion with the fundus in the hollow of the sacrum or higher up. This means that the internal fingers must be introduced high up into the posterior fornix, that the body must be pressed firmly against the elbow of the examining arm, and that the finger tips must be pushed up toward the sacral promontory, as when measuring the conjugate diameter in

Fig. 7.—The uterus is not found in anteflexion or anteversion. If it is then not found in retroflexion (as in Fig. 6), it must be in the position known as retroversion, and the internal fingers, if introduced deeply into the posterior fornix, can feel the straight continuation of the cervix into the fundus.

obstetric cases. If the uterus is not found in anteflexion or anteversion or in retroflexion, it must be retroverted (Fig. 7). The external hand then presses on the abdomen from the umbilicus down, and generally the uterus can be palpated, but very often the size, breadth, and thickness cannot be accurately made out. In such cases the adnexa may be situated beyond the reach of the external and internal fingers.

The next step is to determine the mobility of the fundus if it is retroverted or retroflexed. The fingers are pushed high up

into the posterior fornix and a retroflexed fundus should be lifted up. In freely movable cases the manipulation does not cause pain, but if the uterus or the adnexa are fixed by adhesions or inflammatory products, this manipulation is painful. To determine the mobility of the fundus, the second finger passes high up into the posterior fornix and lifts up the fundus, the index-finger is passed anterior to the cervix, and the cervix is steadily and constantly pressed downward and then backward. With this manipulation, unless the area of the internal os is very soft, the fundus will be elevated. If this manipulation is repeated gently but firmly several times, the fundus of a movable retroflexion, and surely the fundus of a retroversion, will be elevated sufficiently to enable the fingers of the external hand pressing on the abdominal wall below the umbilicus to pass posteriorly to the fundus. Then by steady forward movement of these fingers toward the symphysis, accompanied by the pushing of the cervix backward and upward with the internal fingers, a movable retroversion and retroflexion can readily be brought into anteversion or anteflexion.

The above-mentioned manipulation of the fundus is often too painful to be carried out, and is often prohibited by adhesions of the posterior wall of the uterus, or by adhesions of the adnexa, or by parametritis. Adhesions of the posterior wall of the uterus represent peritoneal bands, which may often be felt during this manipulation, especially if the internal fingers are passed high up into the posterior fornix. These perimetritic bands are sometimes stretchable and multiple, and must be distinguished from thickened or shortened uterosacral ligaments, which are only two in number, and which run backward and outward from the cervix. If such bands are not firm, and the fundus brought sufficiently forward so that the external hand can be behind it, further attempts at moving the fundus may be successful. They are generally prohibited either by pain, by firmness of the adhesions, or by adhesions of the adnexa, any of which may limit mobility.

A most important point in the examination is to ascertain not only the mobility of the fundus, but the mobility of the cervix, which depends on its attached ligaments, particularly the broad

ligaments and the uterosacral ligaments. It is essential to determine the condition of the broad ligaments, of the uterosacral ligaments, and of the posterior parametrium. Fresh or old infiltrations in *the broad ligaments* are felt more or less closely connected with the uterus or more or less closely connected with the pelvic wall. Such conditions often cover the

Fig. 8.—With the tip of the middle finger under the cervix in the posterior fornix, the uterus can be lifted up toward the abdominal wall and an anteflexed or anteverted uterus is brought into touch with the external fingers. This manipulation tests the mobility of the cervix, determines the degree of pain produced thereby, and puts the posterior parametrium and the uterosacral ligaments on the stretch so that the latter are readily palpated. If the uterus is retroverted or retroflexed both fingers must be introduced into the posterior fornix.

tubes and ovaries or prevent their bimanual palpation. In other cases, one or the other of the broad ligaments is sclerotic or shortened, with or without the existence of vaginal scars running from cervical tears over to the lateral wall of the vagina. These not infrequently pull the cervix toward their side and prevent its being pulled or pushed to the other side.

The condition of *the posterior parametrium and the uterosacral ligaments* is a matter of paramount importance. In some cases, as a result of parametritis, the posterior fornix is short and sensitive and pressure causes pain. Attempts to lift the cervix upward demonstrate restricted mobility and cause pain. But if this condition is not marked, the fingers can pass high up into the fornices, and by a steady manipulation the uterus may be lifted upward (Fig. 8) and held with the index-finger, while the second finger, moving from one side to the other, often finds the uterosacral ligaments lengthened and sensitive, or shortened and sclerosed thus limiting the mobility of the cervix.

The internal fingers should palpate the pelvic wall, passing as high up as possible into the hollow of the sacrum, and then toward the lateral pelvic wall, to determine the presence of exudates or infiltrates, or the presence of adherent tubes and ovaries, or of pyosalpinx or of movable or fixed prolapsed cystic ovaries, or movable or fixed small ovarian cysts.

If, in the course of bimanual examination, the external hand feels a mass in one inguinal region or the other, or in the median line between the symphysis and the sacrum, or above the true pelvis, we are concerned with the possible existence of a pregnant uterus, or of a fibroid uterus, or of a fibroid attached to the uterus by a pedicle, or of an ovarian cyst. We must determine whether we are dealing with an enlarged uterus (pregnancy or fibroid), or whether we are concerned with a cyst or solid tumor of the ovary or with a solid tumor attached to the uterine body by a pedicle (fibroid). The existence of a pregnant or fibroid uterus is partly determined by proving the continuity of the tumor felt by the abdominal hand with the cervix. This is done by gently palpating from above downward to the symphysis. Pushing upward on the tumor with the abdominal hand distinctly pulls the cervix with it. Tapping of the abdominal tumor with the hand is communicated directly to the fingers applied to the cervix. Pushing the tumor to one side or the other moves the cervix distinctly.

In the case of an ovarian cyst or a pedicled uterine fibroid the essential point is to prove the existence of a pedicle. This can

be done by putting the patient in the Trendelenburg position. Pushing up on the tumor, we may feel with the external hand and with the internal hand a space between the tumor and uterus, and may actually recognize the pedicle. Pushing such ovarian tumors upward does not pull the cervix upward. Marked tapping of the tumor is not readily communicated to the cervix. If the uterus can be made out to be of normal size, of course the abdominal tumor is proved to be either an ovarian tumor or a pedicled fibroid. This differential diagnosis is often

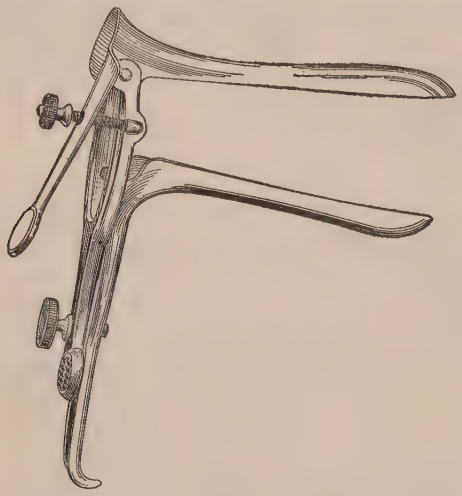

Fig. 9.—Graves' bivalve speculum, which can be adjusted so as to give various degrees of separation of the anterior and posterior blades. When detached, the posterior blade is a good substitute for a Sims speculum. *Hyams* has improved this speculum by an electric light bulb, attached to the upper blade.

aided by grasping the cervix with volsella. By pulling down on the volsella, a separation of the uterus from the tumor and the feeling of the pedicle are rendered more easy.

The differential diagnosis between pedicled fibroid of the uterus and solid ovarian tumor demands the finding and feeling of the pedicle, which is harder and firmer in the case of a fibroid than in the case of an ovarian cyst.

The existence of ascites in conjunction with the presence of an abdominal tumor, or without its presence, and the determination as to whether the fluid is free or encapsulated, is an important point, but often very difficult of determination.

Examination by Specula.—Inspection of the cervix, vagina, and uterine cavity and treatment of the same are carried out with the aid of specula (Figs. 9 and 10). The introduction of bivalve specula shows the color and character of the vault of

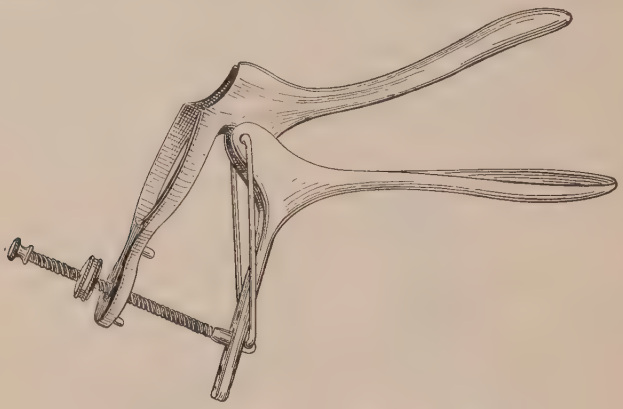

Fig. 10.—Brewer's bivalve speculum.

the vagina and brings the cervix well into the field. The selected speculum should not be too long, else the fornix is too widely stretched and the cervix will be drawn high up and not readily reached. If the speculum is too small, then the lateral

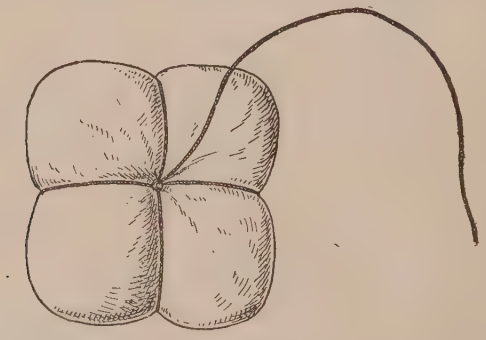

Fig. 11.—The Schultze tampon, made of cotton and introduced through a bivalve speculum and packed about the cervix, takes up during twenty-four hours the secretion from the cervix and uterus, gives us an idea of the amount and character of the cervico-uterine discharge, and furnishes the material for microscopic examination for pus cells, epithelia, and bacteria.

walls of the vagina bulge into the lumen of the speculum and the cervix is not readily seen nor treated. For examination of the vagina and for its treatment Ferguson cylindrical specula are

essential. When of the right size, properly lubricated, and introduced with a gentle rotatory motion, they give an excellent exposure of the cervix, and by gradual withdrawal toward the vulva show the color, character, and lesions of the vaginal mucosa.

The use of the bivalve speculum also discloses the cervix. We note the character of the outer covering of the vaginal portion, the character of the external os, the existence of erosions, or ulcers or ectropion. We see the character and color of the cervical discharge. The fornices are thoroughly sponged with lysol or carbolic solution and some of the cervical secretion is taken and a smear made for microscopic examination. If the cervix is free of mucus, or if it can be gently freed of mucus,

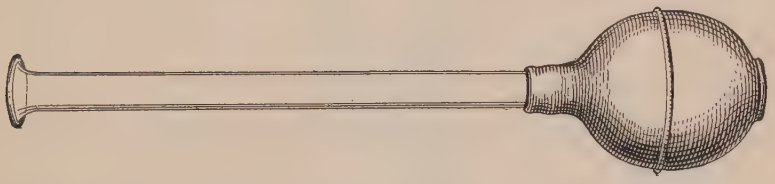

Fig. 12.—Long glass tube with ampulla and large rubber bulb to be introduced through a bivalve speculum and applied over the dried cervix to draw out by suction the cervico-uterine discharge for examination.

a thin platinum loop may sometimes be introduced into the cervix for the purpose of collecting the material for a smear.

It is important to determine the character and amount of the cervical and uterine discharge, as distinguished from the vaginal discharge. For this purpose a fair-sized bivalve speculum is needed. The vagina and fornices are thoroughly cleansed with lysol or carbolic solution. A square piece of absorbent cotton three inches square and fairly thick is taken and a piece of strong thread is tied about it just tight enough to indent the sides slightly. The cotton remains flat. Another piece of thread is tied about the cotton at right angles with the first thread, each knot being tied at the middle of the flat surface, and at the same point (Fig. 11). The cotton is then introduced with the side reverse to the knot uppermost, and is brought over the external os. The four corners of this flat cotton tampon are pushed upward snugly into the four fornices of the vagina, the speculum is carefully removed, and the string

is left hanging out of the vagina. At the end of twenty-four hours this tampon is removed, preferably after introduction of the bivalve speculum. Whatever secretion has been discharged by the cervix and the uterus during the previous twenty-four hours remains on the upper surface of the tampon. The mucoid elements are from the cervix. Pus thoroughly mixed with mucus means that the mucopurulent discharge has come from the cervix. One or more accumulations of pus free of mucus signify a uterine secretion. The distinction

Fig. 13.—Large powerful rubber bulb to be compressed and applied closely into the outer end of a Ferguson speculum which has been introduced and pressed snugly into the fornix about the cervix. By its suction action it draws out the cervico-uterine secretion, and if applied for several minutes produces a uterine hyperemia which has the therapeutic value attributed to Bier's suction hyperemia.

between the two can readily be made when the loop takes up portions of the discharge for the making of smears. The cervical secretion is thick and tenacious, while the uterine discharge is thick and not mucoid and is easily distributed over the surface of the slide. Another method of obtaining cervical secretion, and sometimes uterine secretion, is by the use of suction. A long tube about the size of a test-tube, with an upper trumpet end made to fit over the cervix like the end of a breast pump, and with a rubber bulb like that of the breast pump at the other end, can be inserted through the bivalve speculum and placed over the external os after the cervix has

been thoroughly dried (Fig. 12). One or several applications to the cervix draw out from the cervical canal a serous, mucoid, or purulent discharge, and cause edematous swellings around the external os. In addition to this, long pipets may be introduced into the cervix, and if the bulb attached is powerful enough an intrauterine discharge may be obtained. The same

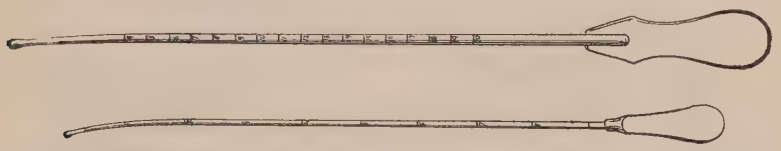

Fig. 14.—Uterine sounds for determining the position of the uterus, the length of the uterine cavity, the character of the endometrium, and the size, character, and sensitiveness of the internal os. They serve almost the same purpose when passed into the urethra.

result may be obtained by using a small Bier cup on the end of the suction tube of a compressed air apparatus. In practically all cases, however, the above-mentioned cotton pledget, the Schultze tampon, meets all the indications for obtaining the cervico-uterine discharge over a period of twenty-four hours. (See also Fig. 13.)

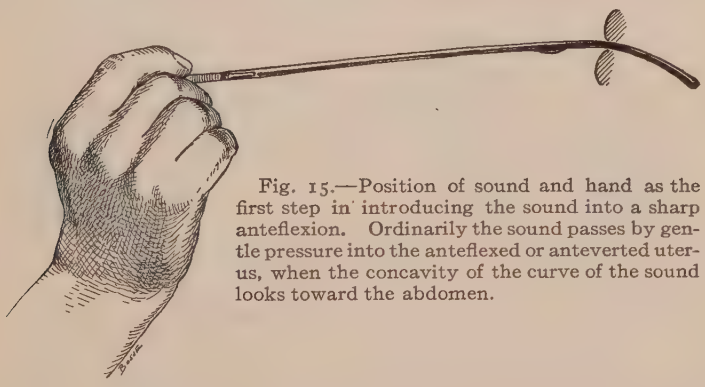

Fig. 15.—Position of sound and hand as the first step in introducing the sound into a sharp anteflexion. Ordinarily the sound passes by gentle pressure into the anteflexed or anteverted uterus, when the concavity of the curve of the sound looks toward the abdomen.

Uterine Sound.—In determining the character, structure, and condition of the uterine lining, and the size and length of the uterine cavity, it is often advantageous to palpate the inner surface of the uterus with the aid of a uterine sound (Fig. 14). The uterine sound is sometimes necessary to define the position of the uterus when this cannot be accurately determined

bimanually; to differentiate the uterus, by determining its position, from masses or tumors behind it or in front of it; to determine its length and thus corroborate the existence of a uterine fibroid as against an extrauterine tumor, if the uterus is found to be very much enlarged. By some, the sound has

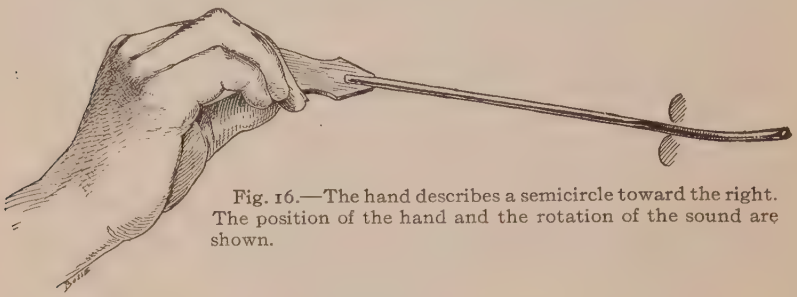

Fig. 16.—The hand describes a semicircle toward the right. The position of the hand and the rotation of the sound are shown.

been used to aid in restoring a retroflexed uterus to its normal position, a manipulation which is fraught with much danger. As a rule, however, the use of the sound can be dispensed with. It is an instrument which can do much harm. It may carry infection from the cervix up into an uninfected fundus. When used, extreme gentleness is imperative; the vagina and cervix

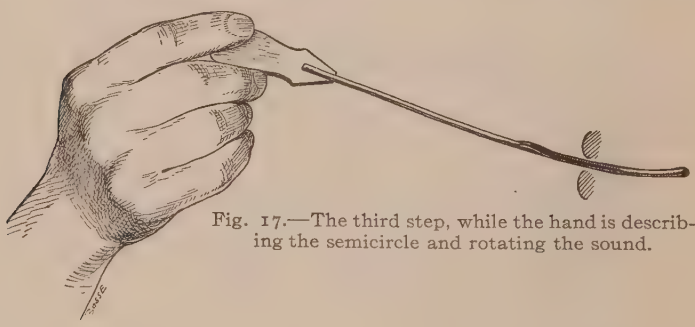

Fig. 17.—The third step, while the hand is describing the semicircle and rotating the sound.

should be thoroughly cleansed; the speculum should be sterile, and the sound thoroughly sterilized. In some cases, without marked anteflexion, or without marked retroflexion, the sound readily passes forward or backward, or straight in the direction of a retroversion. The handle of the instrument should be held between the thumb and the first finger, and only the gentlest manipulation is permissible. Ofttimes the sound does not

slip past the internal os into an anteflexed uterus. The tip of the sound should then be introduced with the concavity looking downward until the point reaches the internal os; then, by rotating and moving the handle in a circular direction, the hand holding the handle describes a half circle to the right until

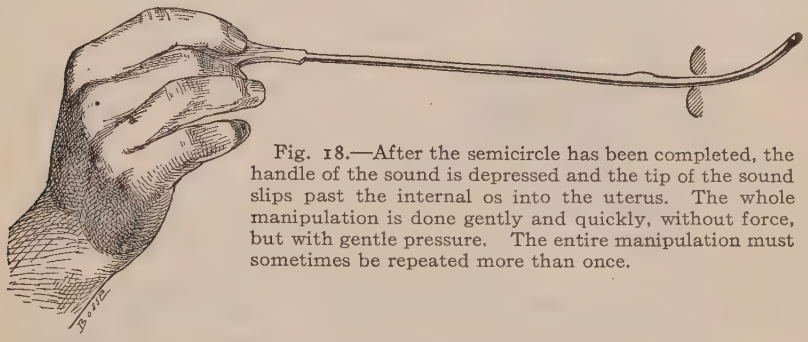

Fig. 18.—After the semicircle has been completed, the handle of the sound is depressed and the tip of the sound slips past the internal os into the uterus. The whole manipulation is done gently and quickly, without force, but with gentle pressure. The entire manipulation must sometimes be repeated more than once.

the handle is as high as a plane extending from the abdominal wall; the handle is then gradually depressed without the use of force until the point slips past the internal os and up into the uterus (Figs. 15, 16, 17, 18). The very opposite manipulation is used when introducing the sound into a sharply retroflexed

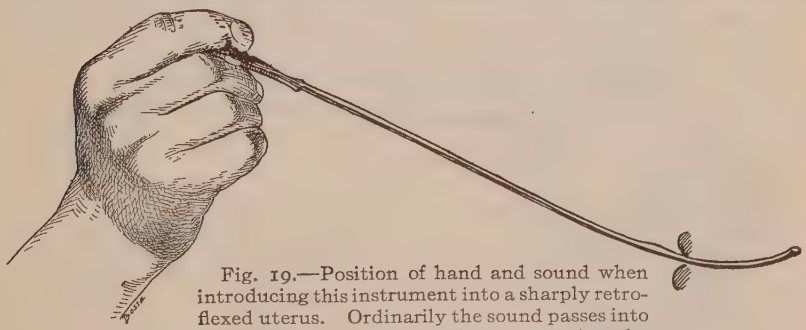

Fig. 19.—Position of hand and sound when introducing this instrument into a sharply retroflexed uterus. Ordinarily the sound passes into aretroflexed uterus by gentle pressure when the concavity of the sound looks down toward the table.

uterus. The tip is inserted as far as the internal os; the plane extending out from the symphysis; the handle is then swung in a large circle to the left until it comes down to a plane level with the table, when it will slip through the internal os into the uterus (Figs. 19, 20, 21). It is often necessary to

loosen the screw of the speculum and to pull the cervix down by volsellum before the sound will pass through the internal os of a sharply flexed uterus.

The sound aids in determining: (1) the length and size of the cervix, the character of the constriction or stenosis of the

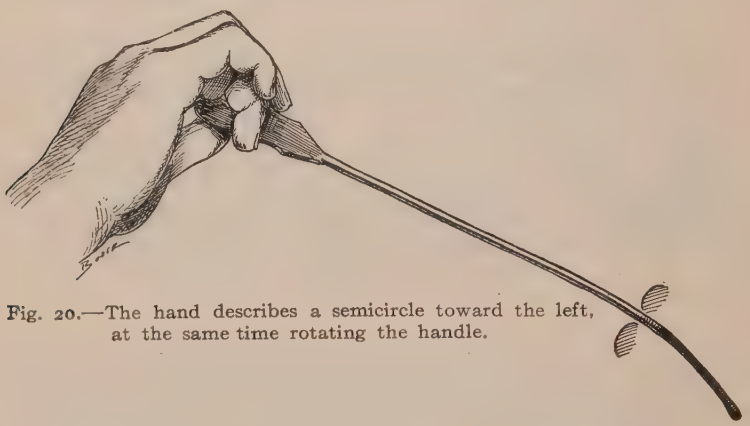

Fig. 20.—The hand describes a semicircle toward the left, at the same time rotating the handle.

external and nternal os, and the sensitiveness of the same; (2) the length and direction of the uterine cavity; (3) the size of the uterine cavity and the thickness of its walls; (4) the character of the inner surface of the uterus and the presence of

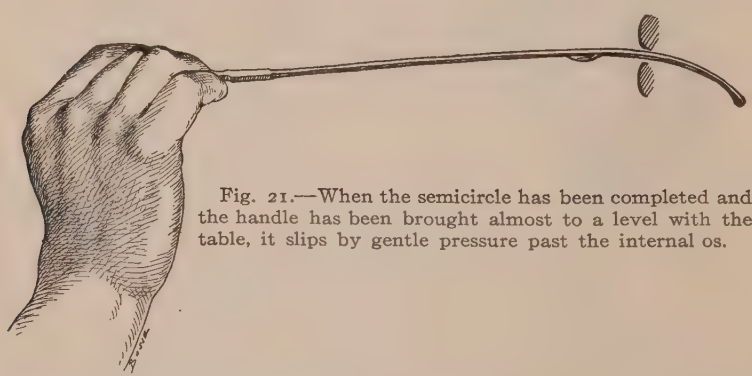

Fig. 21.—When the semicircle has been completed and the handle has been brought almost to a level with the table, it slips by gentle pressure past the internal os.

new-growths; (5) the mobility of the uterus; (6) the sensitiveness of the uterine lining. Its use is contraindicated in pregnancy or when pregnancy is suspected, in inflammation of the uterus and its surrounding structures, in hematocele, in

purulent discharge from the uterus and vagina, in carcinoma of the fundus, and during menstruation. It should never be used through a Ferguson speculum.

Urethra.—The introduction of the finger into the vagina, with palpation and manipulation and massage of the urethra

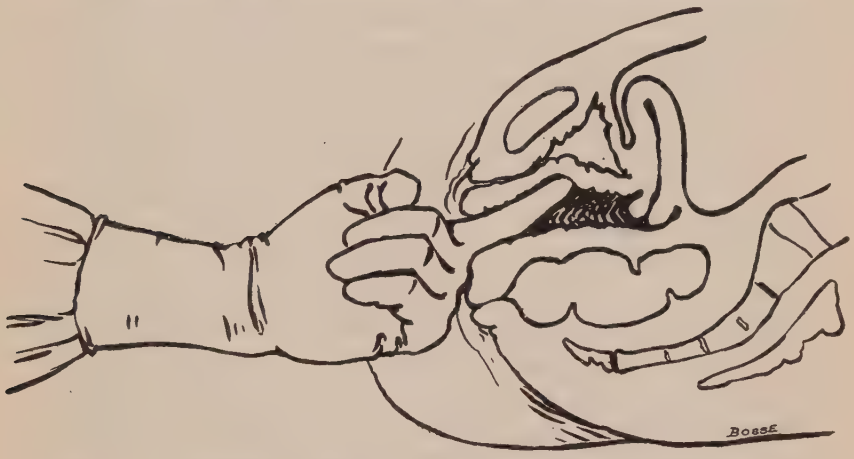

Fig. 22.—Massaging the urethra to determine its character and sensitiveness and to express any secretion contained in its lumen or in the urethral glands for the purpose of microscopic examination. This step often discloses a chronic urethritis and is to be done several hours after the last urination and before catheterizing the bladder.

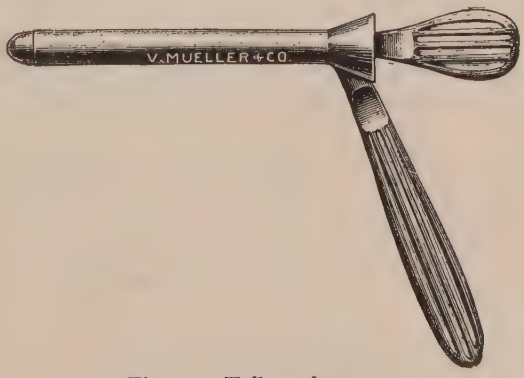

Fig. 23.—Kelly endoscope.

along the anterior vaginal wall, demonstrates the sensitiveness, the degree of infiltration of its wall, and the existence of areas of malignant induration. It also expresses the urethral secretion (Fig. 22).

The uterine sound, when gently introduced into the urethra and gently passed over its entire surface, determines its sensitiveness, the presence of irregularities or new-growths, and the existence of stricture, as well as the sensitiveness of the region of the internal sphincter.

The diagnosis of the lesions in the urethra in chronic inflammatory conditions and the diagnosis of the presence of new-growths demand the use of the endoscope, which is easily applied and used in the female. The endoscope reveals the color and character of the mucosa, the existence of plaques, of infected glands, of polyps, new-growths, and deep urethral caruncles.

Ureter.—The ureter can be palpated by turning the palmar surface of the fingers in the vagina upward and passing up to the level of the internal os, when external abdominal pressure aids in disclosing a cord passing externally and posteriorly and downward into the broad ligament. Thickening and infiltration of the ureter, and calculi within its lumen can often be detected by palpation.

Examination per Rectum.—Examination per rectum is often of the greatest aid, especially in virgins. The index-finger, well covered with a finger-cot and lubricated, is passed high up and readily feels the cervix. Lifting the cervix upwards, the external hand easily feels an anteflexed uterus. By this manipulation a retroflexed uterus can be readily palpated. A parametritic exudate on the posterior wall of the pelvis or about the rectum can be made out. Prolapsed tubes and ovaries and cases of salpingo-oöphoritis can be distinctly palpated, intrapelvic tumors can be felt, and their contour made out. The uterosacral ligaments and their character can be distinctly recognized.

BACTERIOLOGIC METHODS

Fixing Smears upon a Slide or Cover-glass.—In fixing specimens upon the slide or cover-glass for microscopic examination, it is essential that the smear be very even and thin. The smear is allowed to dry in the open air, in a thermostat, or by gently warming over a flame. It is then passed through the

flame three times, if made on a cover-glass, or if on a slide until it is heated to a degree just tolerated by the back of the hand.

Staining for the Gonococcus.—The gonococcus is an organism occurring in the shape of oval or coffee-bean shaped bodies. It is generally grouped in twos or fours, and resembles the German biscuit in appearance. It is found either free in the discharge from the urethra or in the secretion of the cervix, or, as is more often the case, it is inclosed within pus and epithelial cells. In examining specimens on cover-glass or slide, attention should be paid only to the intracellular diplococci, for they alone can be considered diagnostic of gonorrhea. Special care must be exercised to distinguish the gonococcus from the micrococcus catarrhalis.

The secretion is taken upon a platinum loop, spread upon a cover-glass or slide, and fixed by the ordinary method.

The staining is done in one of two ways: The first and simplest method is to stain the specimen for one minute in a 1 per cent. aqueous solution of methylene-blue, and then wash it in water. The gonococci and the cells are both stained blue. If the characteristic diplococcus is found in the pus and epithelial cells by this method, one can be reasonably, but not positively, certain that the discharge is of a gonorrheal character.

A refinement of this method is the employment of the eosinate of methylene-blue (Jenner). In this stain the organisms are stained blue, while the granules of eosinophilic leukocytes, which are usually present in large numbers and which are considered to be a characteristic feature of the gonorrheal discharge, appear as a bright or brownish red. The smear is immersed five minutes in this stain, washed and replaced in water, dried with filter-paper, and mounted.

The second, known as the Gram method, is more diagnostic than the above, because it differentiates the gonococcus from other diplococci which may be present in pathologic secretions. The smears are fixed by heat and stained in a solution of gentian-violet (10 parts saturated alcoholic solution of gentian-violet to 90 parts of 25 per cent. solution of carbolic acid—Fraenkel). The solution should be placed in a watch-glass and the smear allowed to rest upon the surface of the stain for

three minutes. It is then blotted with filter-paper and without washing is covered with Lugol's solution (1 grain of iodin, 2 grains of potassium iodid, and 300 c.c. of distilled water) for two minutes, then blotted with filter-paper and washed immediately in 95 per cent. alcohol for thirty seconds, or until the blue stain ceases to come away, when it is at once washed in water and counterstained with an aqueous 1 per cent. solution of Bismarck-brown or of acid fuchsin. By this method the gonococci are stained brown or red, depending upon the counterstain used, while the other cocci, which may be present in the discharge, are stained blue.

Fixing Slide for Tuberculosis Stain.—In staining for the bacillus tuberculosis the smears of the discharge are fixed in the ordinary manner and are stained for one minute to three minutes in Ziehl-Neelsen's carbol-fuchsin stain (90 parts of a 5 per cent. solution of carbolic acid and 10 parts of a concentrated alcoholic solution of fuchsin). While staining, the spread is held over a flame until steam appears, and is kept there without being allowed to boil. It is then blotted and placed either in a 20 per cent. solution of nitric or of sulphuric acid for about one-half minute, when it is, without washing, placed in 95 per cent. alcohol and moved to and fro until the preparation loses all its red color. It may, however, be necessary, in order to facilitate this latter change, to repeatedly re-immerse for a few seconds in the acid solution and then again in alcohol. After decolorization it is counterstained by a concentrated solution of methylene-blue for a few seconds, then washed off in water and mounted in balsam. The tubercle bacilli will be stained red and all the other bacteria and cellular elements will be stained blue.

Preparation of Centrifuged Sediment of Urine for Microscopic Examination.—The sediment is usually examined for crystals, casts, cellular elements, and for bacteria. The cellular elements comprise leukocytes, erythrocytes, epithelial cells from the bladder, ureter, or kidney, and shreds of tissue from a neoplasm.

It is sufficient in demonstrating casts or crystals to place some of the sediment under a cover-glass and examine without further preparation.

In examining for pathogenic bacteria, including tuberculosis, the sediment should be spread upon several slides or cover-glasses and allowed to dry slowly either in the thermostat or in the open air. They should be covered to protect them from dust, and the amount of sediment on each slide should not be too great in quantity, so as to avoid too thick a smear or spread. If the smears are too thick, a film is formed which will not adhere to the glass. After drying, pass through a flame, as is done ordinarily in fixing smears, and then stain.

This method will stain the cells as well as the bacteria; but if special attention is to be paid to the cellular elements, it is better, after the spreads are dried, to fix them in a solution of equal parts of strong alcohol and ether, or 5 per cent. formalin, anywhere from five to ten minutes, and then wash in water. This likewise applies to the fixation in preparation of any shreds of tumor tissue which may be found in the sediment or floating in the urine. Methylene-blue and eosin or hematoxylin and eosin may be used as a stain for the tissue.

When tuberculosis is suspected, the sediment should be obtained from a catheterized specimen of urine in order to avoid confusion with the smegma bacillus. If this is impossible, the spread should be stained with carbol-fuchsin and decolorized in acid and alcohol and then, before counterstaining, should be placed in 95 per cent. alcohol for at least twelve, and better twenty-four, hours. Then counterstain, and if any red stained bacilli remain, they are in all probability the tubercle bacilli.

Cultures for Gonococci.—Culture of gonococci is extremely difficult, as they do not flourish on any of the available culture media. They perhaps grow best on serum-agar. A small loopful of the discharge is transferred from a platinum loop to a platinum spatula and drawn or streaked across the surface of a serum-agar culture plate, or the loopful may be placed at one point on the surface of the plate and streaked across with the spatula. As many as five or six streaks may be made on one plate, and the individual colonies of gonococci will subsequently be found along the line of the streaks last made.

Cultures from Urine.—Urine from which cultures are to be made must be obtained by catheter in a sterile tube or bottle,

and then sent to a laboratory for bacteriologic examination. No chemical substance should be put in the urine with the idea of preventing decomposition.

Inoculation of Guinea-pigs for Tuberculosis.—The urine to be used for inoculation must be obtained by catheter in a sterile receptacle and allowed to stand until a sediment has formed. This sediment is then removed and centrifuged in a sterile tube. It is well, when possible, to wash the sediment several times with sterile normal salt solution, especially if the inoculation is to be intraperitoneal. After the sediment has been concentrated as much as possible by centrifuging, it is drawn up into a syringe and the guinea-pig inoculated either intraperitoneally, under the integument of the abdomen or of the inner surface of the thigh. Shaving of the skin and washing with some antiseptic solution is all that is necessary in the preparation of the guinea-pig.

The inoculation under the skin is, as a rule, preferable to intraperitoneal injection, for the reason that there is less chance of killing the animal by sepsis.

Occasionally the sediment may be too thick to be drawn into the syringe, in which case it will be necessary to dilute it, either with sterile normal salt solution or with sterile bouillon. As a rule, 2 c.c. of either the sediment or its suspension is sufficient for the test. It is essential, after the guinea-pigs have been inoculated, that the animals be kept under the best possible hygienic conditions. If tuberculosis develops, the animal will generally die anywhere from within four to six weeks. If it lives after the expiration of this time, it should be killed and the autopsy performed. Preliminary exposure of the guinea-pig to the x-ray increases his susceptibility to such an extent that tuberculosis will usually develop within ten days.

If the animal has been inoculated subcutaneously, either in the abdomen or thigh, inguinal glands will generally appear and grow quite large within two or three weeks if tubercle bacilli are present.

Staining for the Spirochæta Pallida (Schaudinn).—It is essential in examining spreads for the Spirochæta pallida that they be made very thin. The discharge from an ulcer or from

the initial lesion may be examined, but it is better, after first removing the discharge from the surface, to get the serum which may be expressed from the lesion. The spread is allowed to dry, then fixed in 95 per cent. alcohol for one hour, then placed in Giemsa's stain (Grübler) for ten minutes to one hour; wash in water, dry with filter-paper, and mount in balsam and examine with the immersion lens.

The spirochæte are from 4 to 14 mm. in length, very thin and delicate, pointed and drawn out to a fine filament at the end. They have from six to fourteen convolutions and they are sharp, narrow, and screw-like. They have very little affinity for the anilin dye and hence stain very faintly. It requires very careful search to detect them.

HEAD ZONES

Head has described certain definite and constant areas of cutaneous tenderness associated with diseases of the different viscera. He found in many visceral affections that if the sensitiveness of the skin was tested by running a pin point over the cutaneous surface, there could be shown to exist areas over which there was a more or less marked hypersensitiveness to pain. These areas are constant and distinct; they can be mapped out on the surface of the skin, and when present they signify an affection of the organ to which they correspond. The skin tenderness is very superficial, quite different from tenderness on pressure, and extends over definite areas which never overlap one another. Each area, or zone of hyperalgesia, has a maximum region which often corresponds to the location of the pain complained of by the patient, and coincides with the areas marked out in patients suffering from attacks of herpes zoster. There is an intimate association between the central connections for the nerves of the viscera and the nerves which supply the sensations of pain, heat, and cold, and those which exert trophic influences on the skin. The areas correspond to segments of the spinal cord, not to the distribution of the peripheral nerves or spinal nerve-roots or brain areas. The zones of each side never extend beyond the median line in front or behind (Elsberg and Neuhof).

A sharp pin is held between the thumb and index-finger of the right hand, the nail of the index-finger resting on the patient's skin. The pin is then made to traverse slowly the surface of the skin, care being taken that the nail of the index-finger presses equally along the area examined. The patient is instructed to say "Now" as soon as the pin stroke becomes painful. The pin traverses the abdomen from side to side and from above downward. The points at which the patient complains of pain are marked. In this manner it is possible to map out the hyperalgesic area on the skin, and when such an area has been found the pin is made to approach it on all sides, so that its form and position may be determined. Care must be taken that the pressure of the pin point remains constantly the same, especially as the pin passes over the groin and slips off the costal border or over the crest of the ilium. After the zone has been thus mapped out on the skin, the procedure is repeated a second time. It is a good plan for the operator to control both patient and himself by keeping both his and the patient's eyes away from the pin. There is considerable variation in the sensitiveness of different persons. It is, therefore, of advantage first to gain an idea of the general sensitiveness to pain on the part of the patient. For this purpose Libman's test is of value. If one makes pressure with the thumb over the styloid process in the neck, one may gain a fair idea of the degree to which an individual is sensitive to pain. Some patients will complain of the slightest pressure, in others a considerable degree of force is required. It is often a good plan to control the patient's statements by testing the skin near the spine on the side opposite to that upon which the zone has been found. This is to be done without the knowledge of the patient (Elsberg and Neuhof).

The hyperalgesia is sometimes so marked that the patient will shrink or cry out as soon as the border of the zone is reached. The zones appear early in the course of visceral affections and usually persist throughout the course of the disease. They disappear at once with the relief of the lesion. The zones may appear after palpation, when they were not present before. The characteristic zone for the appendix may appear after

palpation of the right iliac region in acute appendicitis, the zone for the uterine adnexa may appear after a bimanual examination. The presence of an ice-bag, a hot-water bag, or a poultice may make it impossible to map out the sensitive area, but if ice-bag or hot-water bag is removed, the hyperalgesic zone will appear after about fifteen minutes. The zones may disappear after repeated examinations. After a short interval the hyperalgesic area again appears. The presence of a Head zone alone must not be the only factor in arriving at a diagnosis, it must be used in conjunction with other signs and symptoms. In not a few patients with marked abdominal distention and rigidity the presence of a characteristic zone aids very much in making a differential diagnosis between diseases of gall-bladder and appendix, between diseases of gall-bladder and kidney, between diseases of the appendix and the female adnexa. There is no constant relation between the severity of the pain or the gravity of the lesion and the degree of sensitiveness of the skin. There may be very marked zones with little subjective pain and slight lesions, and only slight hyperalgesia in patients with very severe pains and grave lesions.

The zone appears on that side of the body on which the affected organ has its nervous connections; the side on which the organ is normally situated. If an organ belongs on the left side, the hyperalgesic zone will be found on that side, even if the organ, through disease or mobility, lies on the other side of the body.

The presence of a characteristic zone is evidence of an affection of the corresponding abdominal viscus, although not of necessity the affection which is causing the symptoms.

The zones are present in a large percentage of patients with acute affections of the appendix, of the gall-bladder, of the uterine adnexa, and are of considerable value in the diagnosis of these acute affections.

Zones are frequently present in acute diseases of the other abdominal viscera, and when present aid in making the correct diagnosis.

Cutaneous hyperalgesia may appear early in acute abdominal disease. Its presence is no index of the gravity of the lesion. Its sudden disappearance may be of grave significance.

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In the absence of all other localizing signs or symptoms, the zone may indicate the affected organ. In most instances, however, it must not be used to make the diagnosis, but only as a diagnostic aid to substantiate conclusions reached from a consideration of all the symptoms and signs (Elsberg).

Gall-bladder and Liver.—A zone is present in acute affections of the gall-bladder more often than in any other acute intra-

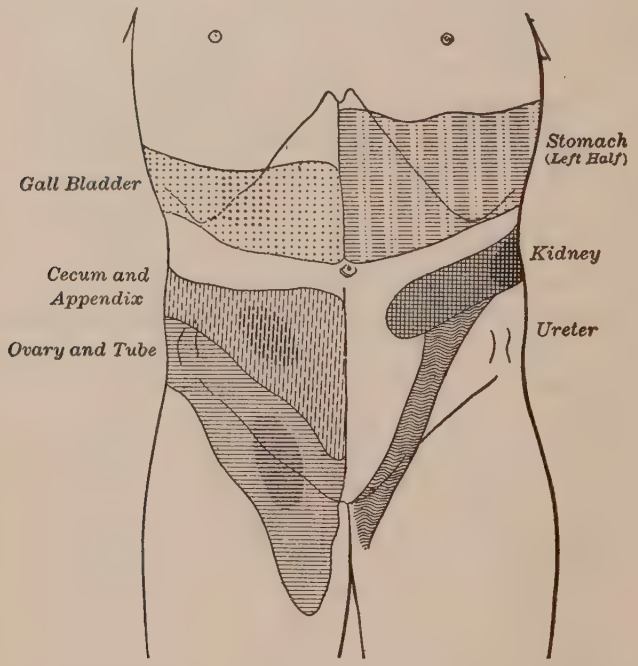


Fig. 24.—The general location and outline of the zones of cutaneous hyperalgesia for some of the abdominal viscera. Anterior view. The maxima are deeply shaded. Only the left half of the gastric zone is given. The ureteral zone consists of a series of maxima (diagrammatic) (Elsberg and Neuhof).

abdominal affection. The recognition of the disease is often difficult or impossible in stout patients without jaundice with marked abdominal distention and rigidity. These patients may refer their pain to the right lower abdomen, and may have their tenderness in this region. Acute intestinal obstruction, acute pancreatitis, or acute appendicitis are diagnoses often made. In some patients the presence of a zone of hyperalgesia has been the only localizing sign.

"The zone lies in the right half of the abdomen, above the level of the umbilicus. The complete zone starts exactly at the median line in front, extending from some distance below the xiphoid to a short distance above the navel. Tracing it backward, it slants obliquely upward, and becomes narrow passing partly over and partly below the costal arch. It is narrowest at the midaxillary line, where it is about 2 inches

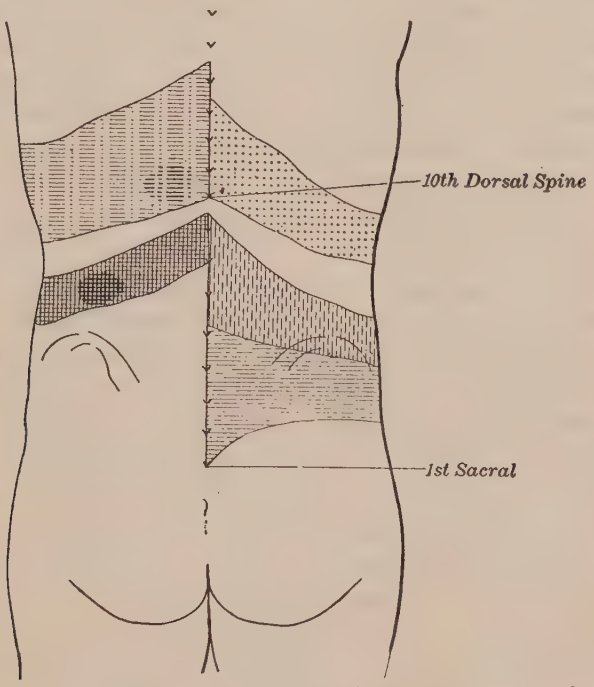


Fig. 25.—The general location and outline of the posterior parts of the zones (diagrammatic) (Elsberg and Neuhof).

wide. Posteriorly, it becomes broader, and at the spine it is about as wide as in front. In some cases more or less of the anterior portion only has been present (maximal area)" (Elsberg and Neuhof).

Kidney and Ureter.—"The kidney zone is wide at the posterior median line, where it begins, and gradually narrows anteriorly. Its greatest breadth is at the spinal column. It narrows to make a triangular area, with a rounded apex, situated a little to that side of the anterior median line on,

which the zone lies. Each zone is strictly limited to its half of the body. There is no difference in contour between the right and left kidney zones. The kidney zones are complicated by the additional ureteral zones that are present in certain cases. The ureteral zone springs, so to speak, from the lower margin of the kidney zone at the anterior axillary line. In an average adult it is about 3 inches wide at this beginning. It narrows in its downward course and, passing obliquely downward and forward, it terminates on its side of the labia. After the first narrowing it widens again well below the umbilical level. There are anterior and posterior kidney maximal areas. The ureteral zone seems to be made up of a series of maxima. The kidney and ureteral zone is most often present, as in the *other intra-abdominal affections, in the presence of pain and tenderness.*"

Vermiform Appendix.—"The zone begins at the median line in front, sometimes a little to its left, from a point a short distance below the umbilicus to one equally distant from the symphysis pubis. It narrows toward the anterior axillary line to a width of about 2 inches (average adult). From this line it widens and spreads to the posterior median line from the eleventh dorsal to the second lumbar spines (approximately). At the anterior median line there is often a tongue-like downward extension of the zone (see Fig. 24). There is an anterior maximal area which is sometimes present alone. It may be that the "appendix" zone is really an "appendix and cecum" zone, because the cecum is so frequently involved in appendicitis. Sometimes, when an ice-bag has been employed over the appendix region, only the posterior half of the zone is present."

Diagnosis has been aided in a considerable number of patients by the presence of the zone, especially in that large class of acute cases in which the abdomen is rigid and there is no palpable mass. The zone has been of the greatest value in helping to differentiate between diseases of the appendix, on the one hand, and those of the gall-bladder or right uterine adnexa, on the other (Elsberg).

If the patient complains of symptoms which resemble appendicitis, and a zone is not present in the right lower abdo-

men, it is well to look elsewhere for hyperalgesia. In the majority of cases of chronic appendicitis or, more properly, cases of appendicitis admitted for operation in the interval, no zone is found.

Uterus and Adnexa.—"The zone for the right adnexa lies on the right half of the median line; that of the left adnexa, on the left half; the zone for the uterus is a combination of the two. Beginning some distance above Poupart's ligament, the upper margin of the zone runs parallel to it, and pursues this obliquely upward course to the spine of the second lumbar vertebra (approximately). The lower margin is a long, tongue-like process that extends halfway down the thigh on its inner aspect. The lower margin, as it passes a short distance below the anterior superior spine of the ileum, approaches the upper, the average breadth of the zone here being 3 inches. The lower border then passes horizontally backward over the buttock to reach the posterior median line partly over the sacrum. Sometimes the upper half of this zone is better developed, sometimes the lower; these may be considered maxima."

"Diagnosis of diseases of the uterus has not been greatly aided by the presence of a zone. In about half of the cases of dysmenorrhea and of endometritis with pain, the zone is present. Some cases of retroflexion, retroversion, anteflexion, and prolapse show the zone. It is present in cases of uterine polyp with pain. It is rarely present in tumors of the uterus. In inflammatory diseases of the tubes and ovaries, especially those of the right side, the zones are of diagnostic value. There are no zones in a large number of patients with tumors and cysts of the ovary" (Elsberg and Neuhof).

DETERMINATION OF THE PATENCY OF THE FALLOPIAN TUBES (RUBIN TEST)

Complete obstruction of the lumen or sealing of the fimbriated end of the fallopian tubes is an absolute cause of sterility in the female. Under these circumstances the ovum and spermatazoa cannot unite and impregnation is impossible. In the case of frank pyosalpinx or marked inflammation of the tubal walls, evident on bimanual examination, the diagnosis is

relatively easy. But not infrequently there may be a hydrosalpinx with flaccid and compressible walls, or occlusion of the fimbriated end by inflammatory products, or polypoid obstruction at the uterine end, or kinking of the tube itself, which cannot be detected by the ordinary diagnostic procedures. Rubin has devised an ingenious method of determining the anatomic patency of the fallopian tubes by the transuterine insufflation of oxygen or carbon dioxid gas, combined with fluoroscopy and

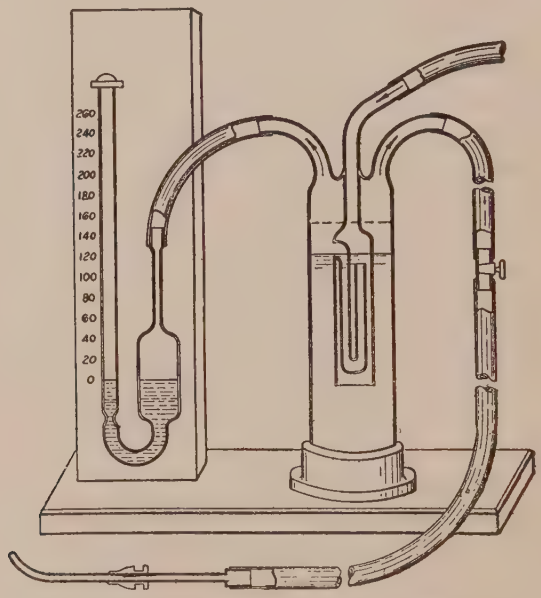


Fig. 26.—Rubin's pneumoperitoneum apparatus.

roentgenography. It provides for inflation of the uterus with gas, and in normal cases introducing a measured quantity of gas into the peritoneal cavity. The method is free from danger in properly selected cases and can be used in office practice.

If the gas passes through the tubes and enters the peritoneal cavity the tubes are patent. But if a pressure of 200 mm. of mercury fails to force the gas through, obstruction of the tubal lumen may be presumed. An artificial pneumoperitoneum establishes definitely the patency of the tubes.

The apparatus and technic are as follows:

The gas tank is connected to a glass flow-volumeter, consisting of an inverted glass siphon within a cylindrical glass meter, calibrated to 40 c.c. A mercury manometer is attached by rubber tubing to one of the two remaining glass tubes passing into the container, while another piece of rubber tubing affords an outlet for the gas from the other. A needle valve is placed in the course of the outlet tubing, and a metal cannula of the Keyes-Ultzmann type is attached to its end. A soft rubber urethral syringe tip is slipped over the cannula to fit snugly into the external os and prevent leakage of gas from the cervical canal. Each pulsation of gas through the meter represents 40 c.c., and four pulsations (delivering 160 c.c. of gas) are all that are necessary to determine the patency of the tubes. The rate of flow is best regulated by pinching the outlet tubing and adjusting the flow so that it requires 15 to 20 seconds to cause a rise of 100 mm. in the mercury manometer. This should be done before the test is started. If there is leakage at any of the joints, the pressure will be negative. The needle valve is released until the cannula is inserted well into the uterine cavity, when it should be shut, making the system air-tight.

Under strict aseptic precautions, the cervix is exposed by means of a speculum, the vagina is wiped dry, and the cervix dried and painted with tincture of iodin. The cervix is steadied with tenaculum forceps grasping its anterior lip, and the direction of the uterine cavity ascertained by passing a uterine sound. Having made certain of the pressure and rate of flow, the cannula is inserted well beyond the internal os, and the rubber urethral tip, placed 1½ to 2 inches away from the cannula tip, is fitted into the external os. The needle valve is then closed, and as the gas enters the uterine cavity, the mercury in the manometer rises. The pressure required to overcome the resistance of the uterus and tubes where there is no obstruction will vary from 50 to 100 mm. After reaching these points it will fall quickly, or slowly, or will fluctuate between them. Occasionally the rise will be higher before it drops, but if it reaches 200 mm. or more this pressure indicates occlusion. One negative result, however, is not sufficient to establish non-patency conclusively. The test should be repeated two or three

times in such cases, because sometimes tubes inflated with difficulty at first may be easily inflated later on. If the tubes are patent and the gas enters the peritoneal cavity, it produces a pneumoperitoneum which can be verified by fluoroscopy or roentgenography. The patient is fluoroscoped in the erect posture and the gas is seen in the right upper quadrant of the abdomen. This causes a subphrenic irritation, and the patient complains of a discomfort in the scapular region. This shoulder pain can be relieved by a moderate Trendelenburg position,

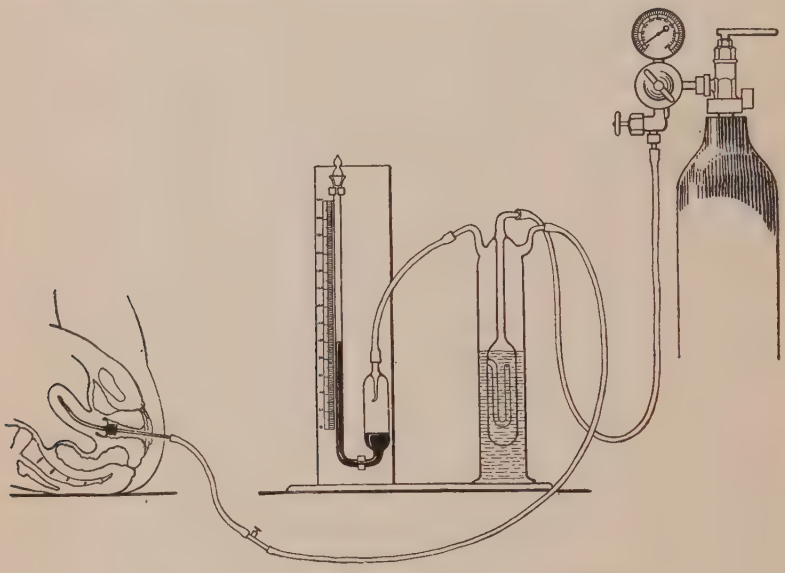


Fig. 27.—The Rubin test for the determination of the patency of the fallopian tubes in operation.

but when only 150 to 200 c.c. of gas are injected the symptoms are slight and do not interfere with the patient's daily routine.

The apparatus is also useful for introducing larger quantities of gas into the peritoneal cavity for pneumo-roentgenography when the tubes are patent, or it is easily adapted to direct transperitoneal inflation by abdominal puncture. The flow being visible through the volumeter, it may be stopped at any point when a desired amount has been given.

When oxygen is used the pneumoperitoneum continues for several hours, as the gas is absorbed slowly. This is of

advantage when there is to be a delay between the time the test is made and the fluoroscopy or roentgenography. On the other hand, the shoulder pains persist for the same length of time. When carbon dioxid is used, absorption is much more rapid, the gas being taken up in about half an hour. The shoulder pains disappear quickly, but if an x-ray examination is to follow the introduction of the gas, it must be carried out promptly; otherwise, the gas will have disappeared. Oxygen may be used directly from the tank, as it is usually supplied under a pressure of 200 pounds, but carbon dioxid comes under such enormous pressure, about 2000 pounds, that it is necessary to attach a regulator and gauge to the tank, to reduce the pressure coming through the tubing. A reading of 15 pounds on the gauge is sufficient for the test.

Before applying the Rubin test, we must be sure of the pelvic pathology. It is contraindicated in acute or subacute infections of the vagina and pelvic organs, in cases of serious heart disease, and just before menstruation. Remember that the gas lifts the diaphragm, and use it cautiously in fat women with cardiac lesions.

The Rubin test is indicated:

In cases of primary sterility in which causes other than tubal disease can be excluded.

In cases of primary sterility with a gonorrhœal history.

In cases of secondary sterility.

In cases of one child sterility.

In cases of sterility following conservative surgery on tubes and ovaries.

After unilateral salpingectomy to determine the patency of the remaining tube.

After sterilization by tube ligation or resection, to demonstrate the success of the operation.

To ascertain whether a "mass" in the lateral fornix is tube or ovary.

URO-GENITAL DIAGNOSIS IN GYNECOLOGY

by

WALTER T. DANNREUTHER, M.D.

When a patient presents herself complaining of symptoms referable to the urinary tract, either alone or associated with those of other pelvic disturbances, their point of origin and cause should be searched for as thoroughly and conscientiously as the source of other gynecological symptoms. While it is not necessary that the gynecologist be also a urologist, he should familiarize himself with modern diagnostic methods, for even though he is not equipped to apply them personally, these patients are entitled to the benefit of all procedures essential to a definite diagnosis. At least an elementary knowledge of cystoscopy is demanded of the gynecologist, because uro-genital derangements and their urinary manifestations are extremely common in women, and the use of the cystoscope is so often required for their proper interpretation. Winter has aptly said, "Cystoscopy has become an indispensable aid in gynecological examination . . . and no gynecologist is completely equipped for the practice of his specialty until he has mastered the cystoscope." It is axiomatic that intelligent and appropriate treatment is predicted on a correct conception of the pathological conditions that obtain.

There are several diagnostic steps available for this investigation, which may be enumerated in the following logical sequence.

1. Careful history taking, with special reference to the presence, character, or absence of uro-genital symptoms.

2. General physical examination.

3. Examination of the urine, including the microscopic appearance of the urine "body" in a long ignition or test tube, estimation of the 24 hour urea output, and the differentiation of the epithelia in urinary sediment.

4. Correlated examination of the blood. (Nitrogenous elements.)

5. Bacteriology of the urine, including smears, cultures, and guinea-pig inoculation.

6. Cystoscopy.

7. Urethroscopy.

8. Chromo-cystoscopy (indigo-carmine function test).

9. Other renal function tests (phenolsulphonephthalein, phloridzin, cystoscopy, etc.).

10. Radiography. (With x-ray catheter.)

11. Pyelography. (With thorium nitrate, iodids, bromids, or silver salts.)

12. Catheterization of ureters.

13. Complement fixation tests.

These constitute the most useful and reliable aids, and may be utilized progressively until a tentative diagnosis is confirmed or one that is definite established. Some cases may be encountered in which it will be advantageous to transpose their sequence, but in most these steps can be taken in the order mentioned, until the underlying pathological cause has been found.

The symptomatology of uro-genital diseases in women is usually meagre and non-characteristic, and the diagnosis therefore depends more upon the objective findings than the subjective manifestations. Pathognomonic symptoms are conspicuous by their absence, and even the cystoscopic picture must not be relied upon exclusively, for this too may be misleading. A patient may relate a history strongly suggesting a renal calculus, and the true condition may prove to be a uro-genital tuberculosis. In another case the cystoscopic findings may point to a vesical tuberculosis, which may ultimately be found to be an ulcerative cystitis. All the clinical data must be assembled and great care exercised in making a differential diagnosis. No single symptom or clinical finding should be accepted as infallible evidence, however significant it may appear. The same symptom-complex may be produced by entirely different pathological changes, and frequently there is a diversity of symptoms in two or more cases of the same nature.

The close association between the organs of the urinary apparatus and other intrapelvic genital viscera should be borne in mind, for this will often account for local symptoms excited by extraneous causes. Arterial hypertension, nervous diseases, syphilis, and other systemic disturbances, the evidences of which are much more readily detected elsewhere than in the urinary tract, may also be responsible for uro-genital manifestations. A patient may complain of increased frequency of urination, and the key to the situation may lie in her endocrine system. Another may also mention this symptom as her sole complaint, and the cause may be an early tabes.

The History.—In taking the history it is well to permit the patient to describe her chief complaints in her own words. She should then be questioned regarding the date and character of the onset and the chronological appearance and severity of her various symptoms. It should be determined whether increased frequency of urination is diurnal, nocturnal, or both, and whether there is any impairment of urinary control. If their is dysuria, simple burning, strangury, and tenesmus must be differentiated. The discoloration of, or sediment in, the urine, as noted by the patient, is seldom of much value, except when a frank hematuria is described, since her observations are usually made after the specimen has been standing for some time. If there is pain, its degree, character, and location should be ascertained. Is it sharp, dull or aching; stab-like, constant, or intermittent? Is it located in the lumbar region, along the course of the ureter, radiating, suprapubic, or urethral. Referred pain is of frequent occurrence. Systemic symptoms, such as chills, fever, loss of weight, reflex digestive disturbances, etc., are of great importance. A history of previous operations will often prove enlightening. The details of the anamnesis are frequently suggestive but seldom pathognomonic.

The Urine and Correlated Examination of the Blood.—Examination of the urine must necessarily extend beyond the routine chemical and microscopical analysis. In the first place, the specimen must be fresh, obtained by catheter, and collected in a sterile receptacle. These are perequisites to avoid

contamination. The labia are separated and the vestibule is cleaned with a pledget of cotton moistened with boric acid solution, before the introduction of the catheter. A metal female catheter, with a small piece of rubber tubing attached,

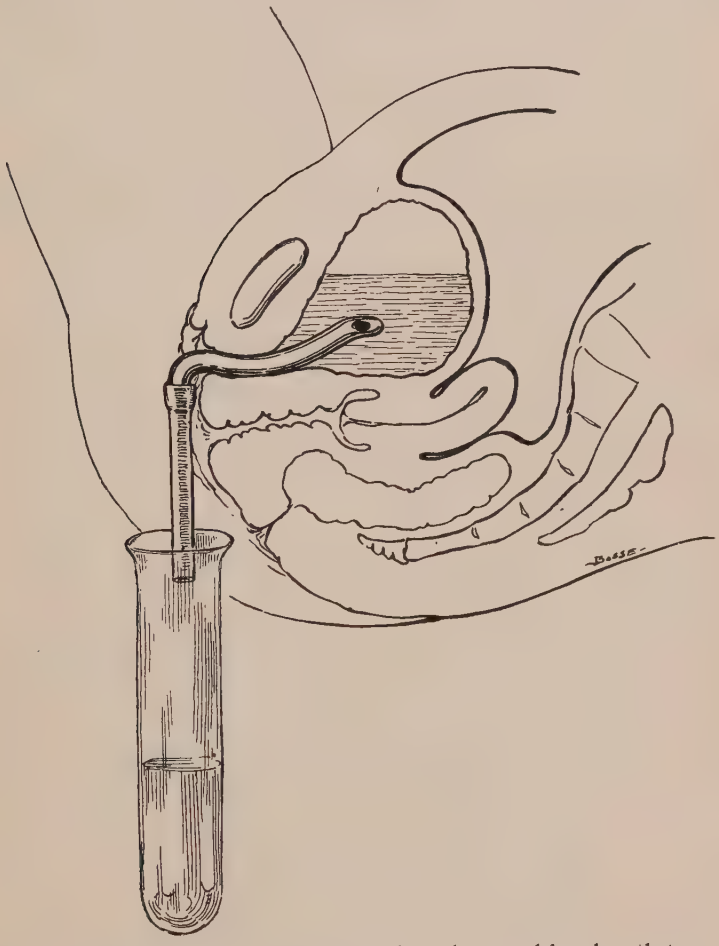


Fig. 28.—A specimen of urine is collected, through a metal female catheter, with a small piece of rubber tubing attached, in a long sterile test-tube.

will be found convenient, as this instrument conforms to the urethral curve and the urine is easily directed into a test tube or pus basin through the tubing. The latter can afterward be connected to the larger tubing coming from a reservoir con-

taining the solution for distending or irrigation the bladder. The gynecologist may advantageously adopt the practice of catheterizing every new patient and collecting the urine in a long sterile ignition tube, after the fashion of the genito-urinary practitioner, since this at least insures an empty bladder, which is essential for a proper bimanual examination. It also affords an excellent opportunity to examine the urine "body," thereby observing its physical properties. On twirling the tube, discoloration, turbidity, flakes, filaments, or shreds are easily detected. Observations thus made will often be at variance with those of the patient. Discoloration of the urine is usually due to the presence of bile, blood, or some chemical agent. Having eliminated these foreign elements, the other physical features of the urine "body" are distinctly suggestive. If the turbidity is of a milky character, a little urine may be poured into a smaller test tube, and a few drops of acetic acid added. If the urine immediately clears, phosphaturia is recognized, whereas if the milky turbidity persists it is probably due to bacteriuria. Visible small granular flakes, equally distributed throughout the urine "body" are often a manifestation of chronic pyelitis, while shreds in the urine usually denote cystitis or urethritis. Flocculent material that does not tend to settle, and remains disseminated throughout the urine "body" after twirling of the tube has ceased, is probably mucus. Heavy flocculent material that becomes ropy on twirling, and tends to settle afterward, is pus. These observations apply to specimens from the female only.

Quantitative estimation of the urea excreted by the kidneys in 24 hours has long been appreciated by the urologist as a diagnostic and prognostic guide, probably because a large proportion of his patients are elderly subjects, suffering from derangements of metabolism. Since the urea output is but an index of the individual's metabolic activities and renal efficiency, the same underlying principles obtain in the female as in the male. Many deaths from unrecognized uremia undoubtedly have occurred after gynecological operations, which could have been prevented by deferring the operation until the subnormal metabolic processes had improved. The kidneys

of a healthy active individual should eliminate 22 gm. or more of urea in 24 hours, and 20 gm. may be regarded as the minimum normal quantity. These figures, however, may be lowered considerably by a restriction of the ingestion of proteids, or some other cause of no pathological significance. It is therefore apparent that to decide whether or not a diminished urine urea content is indicative of disease, simultaneous determination of the nitrogenous elements of the blood becomes a necessary complementary examination.

The non-protein nitrogen of the blood is 25 to 30 mg.; urea nitrogen 12 to 15 mg.; creatinin 1 to 2 mg.; and uric acid 2 to 3 mg., in each 100 c.c. of blood. If a patient's urine urea output is distinctly below normal and these important constituents of the blood are unaltered, the decrease of urea may be disregarded. But if the blood nitrogen is correspondingly increased, perversion of metabolism is quite evident, as this shows hematogenous retention of excrementitious materials. These facts are of paramount importance to the gynecologist, because many of his patients are beyond the prime of life, and none but emergent operations should be attempted while such conditions exist. Much can be accomplished, even though the disturbance be not entirely corrected, by giving the patient mental and physical rest, stimulation of the emunctories, a green-vegetable and milk diet, liberal ingestion of water, alkalis to overcome acidosis, and the administration of such drugs as potassium acetate, potassium citrate, spirits of Mindererus, etc., which promote the elimination of solids in the urine. To recapitulate, a definite decrease in the quantity of urea excreted by the kidneys should be respected as an unfavorable prognostic factor in proportion to the corresponding deviation from the normal of the nitrogenous elements of the blood

Although the possibility of correctly identifying and differentiating the epithelia found in the urinary sediment is still disputed by some pathologists, Heitzmann and his school have demonstrated conclusively that such distinctions can be made. This information is of immense clinical value, as the exact site and degree of intensity of disease processes can thereby be demonstrated.

Smears of the urinary sediment are not as practicable as cultures for the determination of pathogenic microorganisms, because of the myriads of putrefactive elements so often present,

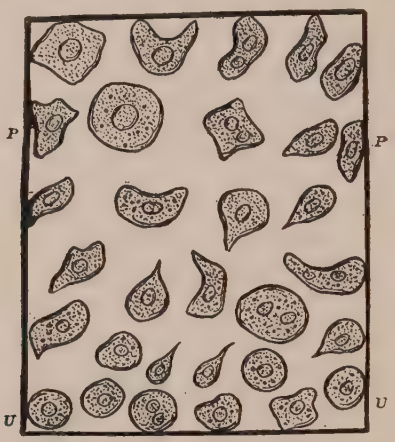
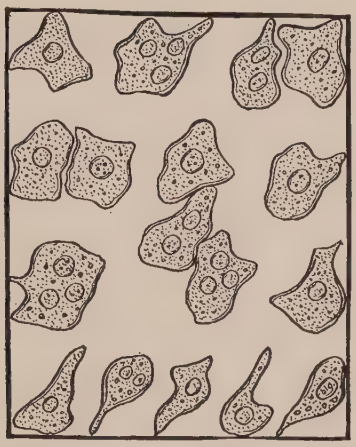


Fig. 29.—Epithelia from pelvis of kidney and ureter (× 500). *P*, Pelvis of kidney; *U*, ureter (Heitzmann).

Fig. 30.—Epithelia from uriniferous tubules of kidneys (× 500). *C*, Convoluted tubules; *S*, straight collecting tubules (Heitzmann).

and the hygroscopic property of urea interfering with the satisfactory preparation and staining of the specimens. Cultures are especially useful for detecting the presence of those germs more commonly found in diseases of the uro-genital tract,



.Fig. 31.—Epithelia from urethra (× 500) (Heitzmann).

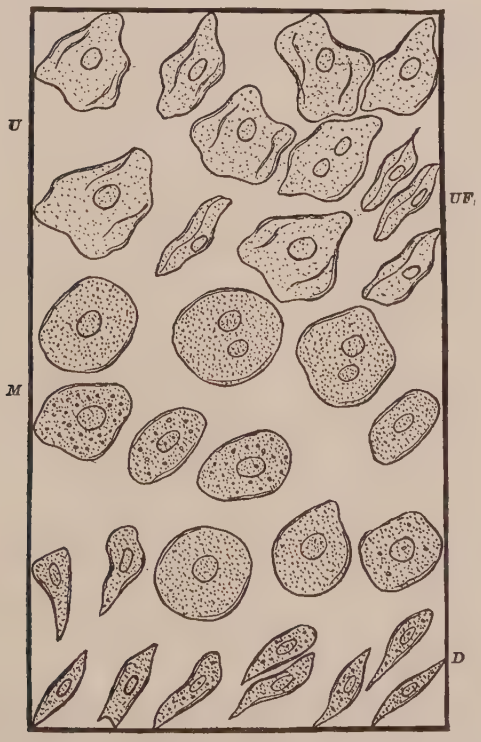


Fig. 32.—Epithelia from the bladder (× 500). *U*, Upper layers; *UF*, upper layers, folded; *M*, middle layers; *D*, deepest layer (Heitzmann).

such as the colon bacillus, streptococcus, etc. The inoculation of guinea-pigs with some of the urinary sediment is another procedure of considerable value in some cases, particularly those of suspected urogenital tuberculosis in which the tubercle bacilli are not found with the microscope. The sediment is injected into the peritoneal cavity of the pig, and at the end of a month the animal is killed, if he does not die before that time. It has been found recently that the guinea-pig can be sensitized by preliminary exposure to the Roentgen ray, so that the tuberculous peritonitis will develop more rapidly.

Fig. 33.—Nitze examining cystoscope.

Female Cystoscopy and Urethroscopy.—Before outlining the technic of cystoscopy, it is pertinent to describe briefly some of the popular types of instruments. These may be divided into two great classes: (1) those that contain a system of lenses (prismatic) and require hydrostatic dilatation of the bladder, such as the Nitze, Otis, and Brown-Buerger; and (2) those for which air distention of the bladder is necessary, and of which the Kelly intravesical speculum is the best example. This instrument is also known as the Kelly cystoscope and Kelly endoscope (Fig. 23). Cystoscopes are also classified as direct vision, where the field observed is directly in front of the tip of the instrument, and in alignment with the eye of the examiner; and indirect, where the field is tangential. The ordinary types of cystoscopes are plain examining, examining and irrigating, ureteral catheterizing (single or double), and operating. A single model, however, may combine two or more of these features. The standard cystoscope gauges are 15, 18, 21, and 24 French. The early instruments contained but a single prism, which inverted the image, but those of modern manufacture have prisms with two reflecting surfaces, the second reinverting the

image. Most cystoscopes at the present time are corrected vision instruments. The Nitze or Otis, indirect vision, plain examining, corrected image instrument is the most useful for female cystoscopic examinations, whereas the Kelly intravesical speculum is more convenient for the topical application of certain medicaments in the bladder, as well as for inspecting the urethra and treating its diseases

The Nitze and Otis examining instruments differ very little in design, both having a long cylindrical shaft which encloses the lens system. The observation window is situated on the circumference near the tip, and there is a small knob at a corresponding point on the ocular end. The latter enables the cystoscopist to recognize at once the position in which the

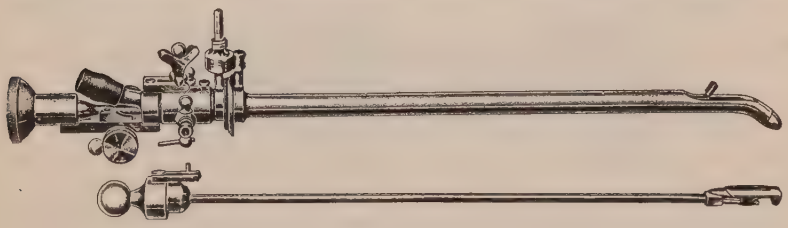


Fig. 34.—Brown-Buerger catheterizing cystoscope (Wappler Electric Co.).

lens is directed. The field observed is at a right angle to the longitudinal axis of the shaft. The angulated beak, containing the electric light bulb, is independent of the lens system and may be detached by unscrewing. Burned out lamps are easily replaced by new ones in this manner. The tip is angulated for the purpose of better illuminating the field observed through the objective lens, and to facilitate the introduction of the instrument past the triangular ligament into the male bladder. For further information regarding the geometrical problems involved in the lens system the reader is referred to works devoted to cystoscopy.

Although the manner of assembly of the different catheterizing cystoscopes is not uniform, the underlying principles of their construction is quite similar. The Nitze and Brown-Buerger are probably the most popular and best for use in the female. In both of these instruments the telescope containing the lenses is introduced into a sheath which encloses the ureteral

catheterizing channels. In the Brown-Buerger cystoscope the bladder medium may be changed through the same channels, by means of two small pet-cocks. But to accomplish this with the Nitze, it is necessary to remove the telescope and replace it with a separate irrigating unit. Kelly and his school advocate the catheterization of ureters through the Kelly intravesical speculum, despite the facts that the technic is difficult for the novice, the knee-chest position is objectionable and tiresome for the patient, and this method offers no advantage over the other, except for the passage of wax-tip catheters or bougies for the diagnosis of calculi and ureteral strictures. The use of the direct vision prismatic cystoscope is seldom required in gynecological practice, because the urethro-vesical junction

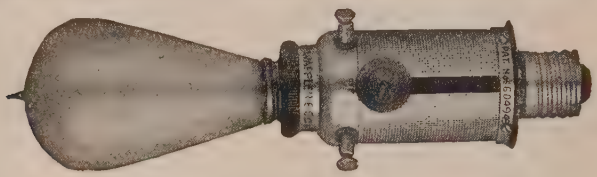


Fig. 35.—Rheostat (Wappler Electric Co.).

and the urethra itself can be readily inspected through the Kelly endoscopic tube. Some instruments intended for use in the female have been made with a short shaft, but this makes the examination extremely unpleasant for the cystoscopist from an esthetic standpoint, and their use is not to be recommended.

Cystoscopes containing lenses cannot be boiled or immersed in hot water, because the heat may loosen the cement holding the lenses in place or crack the glass. It is therefore necessary to sterilize them by means of formaldehyde gas or immersion in a cold 2 per cent. carbolic acid or 4 per cent. boric acid solution.

The illumination of the small electric light is regulated by means of a rheostat, but it can also be directly controlled by the thumb-switch on the coupler of the electric wire cable which connects the rheostat and the instrument. Before attaching the coupler to the cystoscope, the rheostat should be turned completely off. Otherwise an excess of current may burn out the lamp. After closing the thumb-switch, the current can be turned on slowly until the outline of the upper part of the car-

bon filament is no longer distinguishable. The instrument must be well lubricated before passing it through the urethra, and sterile glycerine answers this purpose best because of its free miscibility with water.

Neither local nor general anesthesia is often necessary for female cystoscopy, since all instrumentation is contraindicated in the presence of acute inflammation, unless the exigencies of the case make it imperative. Topical applications of 2 per cent. alypin or novocain, however, are satisfactory agents for local anesthesia in this region.

Ordinarily, the dorso-coccygeal position of the patient is the most satisfactory for cystoscopy. The vestibule is mopped with a pledget of cotton moistened with boric acid solution, and the patient catheterized. After emptying the bladder and collecting a sterile specimen of urine, as previously described, the viscus is distended with warm boric acid solution. When the urine is extremely turbid, repeated bladder washings may be necessary to insure a reasonably clear medium. Having connected up the cystoscope and regulated the illumination of the lamp to the proper degree, the light is put out by opening the thumb-switch on the coupler, and the instrument passed into the bladder. The latter should always be done with the observation lens and beak pointing directly upward, to facilitate its painless introduction under the pubic arch.

The prerequisites for satisfactory cystoscopy with the Kelly intravesical speculum are: bladder and rectum empty, removal of corsets and constricting abdominal bands, and correct knee-chest posture of the patient. These measures promote the gravitation of the intestines out of the pelvis and permit the bladder to distend with the air when the instrument is introduced. The dorsal curve of the back should be somewhat exaggerated and the patient must rest on her knees and forearms, and not on her elbows. The breasts and one cheek must touch the table. Having allowed the vagina or rectum, or both, to fill with air, the urethra is exposed by separating the labia with the thumb and fingers of the left hand, and the cystoscope is introduced through the urethra with the obturator in place, after it has been generously lubricated with glycerine.

On removal of the obturator, air rushes in and distends the bladder. Residual urine can be removed with an evacuator. Satisfactory illumination is secured by means of light reflected from a head-mirror, or by a tiny electric lamp on the end of a

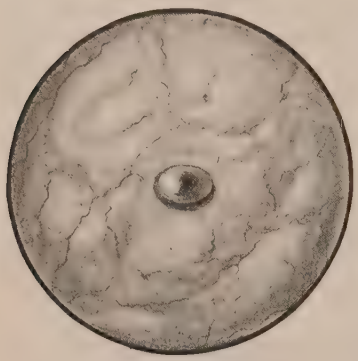


Fig. 36.—Cystoscopic view, showing air-bubble on anterior wall of bladder.

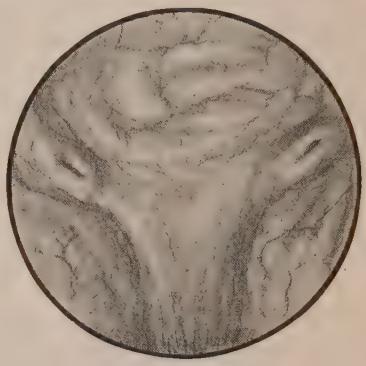


Fig. 37.—Cystoscopic view showing normal trigone.

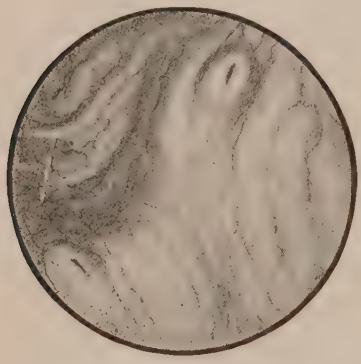


Fig. 38.—Cystoscopic view, showing distorted trigone; the right ureteric orifice is lower, and the left higher, than normal.

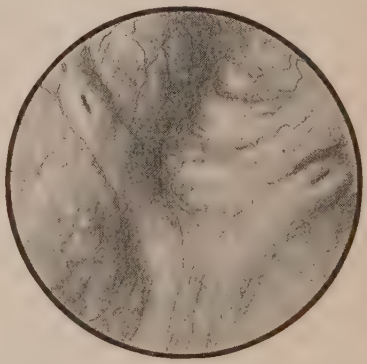


Fig. 39.—Cystoscopic view, showing distorted trigone, the right ureteric orifice is higher and the left lower, than normal.

light carrier, which slides into a groove of the instrument. This lamp also receives its current through a rheostat. The technic of urethroscopy with the Kelly instrument is essentially the same.

There are certain topographical peculiarities of the female urethra and bladder with which the cystoscopist must be familiar.

The urethra is extremely short, and except for Skene's glands and their ducts and abundant mucous glands, contains no other gross anatomical structures. The floor of the bladder is flattened more than in the male. The interureteric ridge is seldom sharply defined and very often is represented by nothing more than a line of demarcation between the trigone below and the paler region above. There is no characteristic arrangement of capillaries, paralleling the vesical end of the ureters. The shape of the bladder is seldom uniform because it depends so

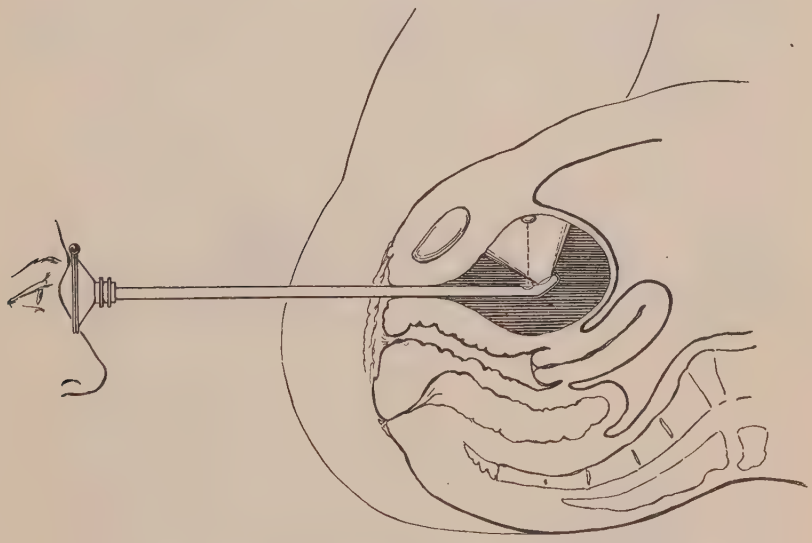


Fig. 40.—The cystoscope is passed into the bladder with the observation lens and beak pointing directly upward, to facilitate introduction under the pubic arch. The first field that comes into view is the anterior wall, where the air bubble will be found.

largely upon the configuration of the surrounding pelvic structures. For the same reason, it is not unusual to find a marked distortion of the trigone, as this frequently occurs in the presence of cystocele, rectocele, displacement of the uterus, pelvic tumors, etc. The urethro-vesical junction in the female may be irregular in outline without a pathologic cause. Anomalous ureters are often found.

The cystoscopic examination must be systematic and complete, but the particular method of procedure is immaterial, provided the entire area of the interior of the bladder is

included. Incomplete distension of the bladder will embarrass the cystoscopist and deceive the inexperienced. The beginner should remember that the same field may look quite differently from various angles and distances, and that as the beak of the instrument is angulated and extends considerably beyond the lens, the tip is closer to the mucous membrane than the shaft. After turning on the light by closing the thumb-switch, the first field that comes into view is part of the anterior wall. Here the air bubble will be found, because

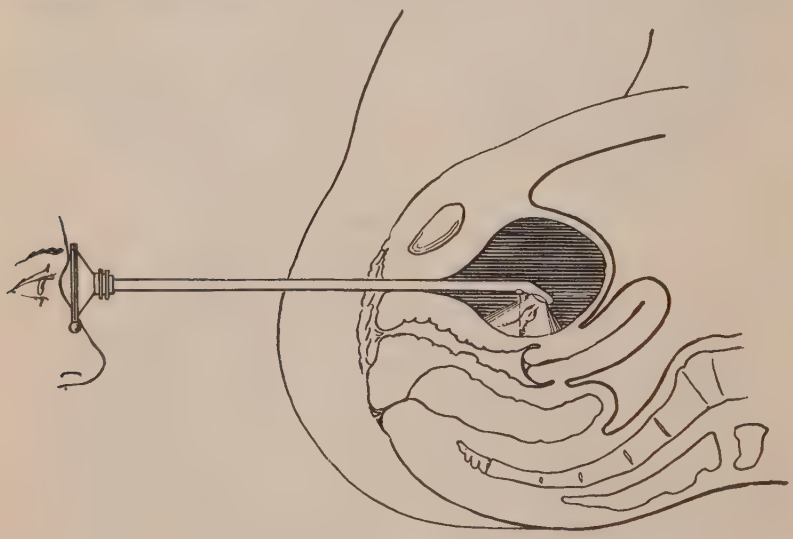


Fig. 41.—Cystoscopic inspection of the triogone of the bladder.

the cystoscope is introduced with the lens directed upward and the patient is lying down. After inspecting this region, the examination may proceed immediately to the orifices of the ureters and the trigone, leaving the remainder of the bladder walls until the last; or the inspection may be made in different antero-posterior planes, by rotating the instrument so that it describes a complete circle each time. Before attempting the diagnosis of intravesical pathological conditions, the beginner should familiarize himself with the landmarks, configuration, and appearance of the normal bladder. Proficiency can be acquired only by practice and experience.

The pathologic changes to be noted are: (1) injection of the blood vessels; (2) localized areas of congestion; (3) areas of ulceration, particularly on the anterior wall and trigone; (4) phosphatic deposits; (5) areas of edema; (6) metaplastic mucous film over the trigone; (7) distortion of the trigone or bladder walls due to extraneous pressure or traction; (8) distortion,

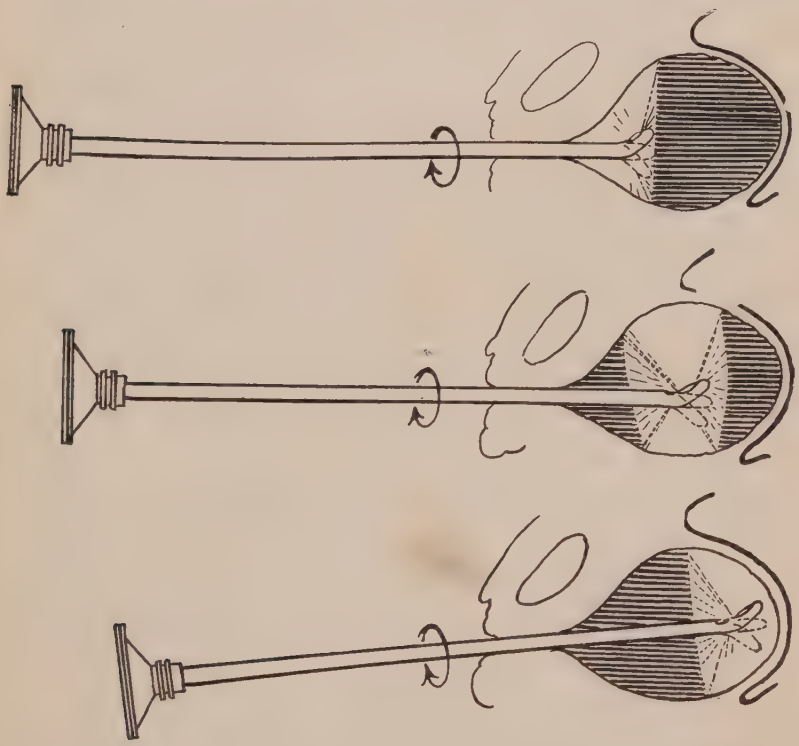


Fig. 42.—Inspection of the bladder may be made in different antero-posterior planes, by rotating the instrument so that it describes a complete circle each time.

pouting, or retraction of the ureteral openings; (9) muscular hypertrophy; (10) trabeculation; (11) new growths; and (12) foreign bodies.

Chromo-cystoscopy.—The term chromo-cystoscopy is applicable to any function test in which conclusions are drawn from cystoscopic visualization of the ejection of colored urine from the ureteric orifices, but the indigo-carmine function test is so

far superior to others of this type that chromo-cystoscopy is generally accepted as a synonym for it. In the surgical field, this one is regarded as one of the most useful of all renal function tests, since the total renal function can be determined to almost the same degree of accuracy as by any other method and a difference of excretion on the two sides is recognized at once. Its obvious advantages are the simplicity of technic, the rapidity with which the results are obtained, the differentiation of the two sides without ureteral catheterism, and the fact that no colorimeter is needed. It is also devoid of disagreeable sequelæ and serious complications. By the behavior of this test the renal efficiency in derangements of metabolism and diseases of the uro-genital tract can be estimated to a fair degree of accuracy. It may also serve to distinguish an extra-renal mass from one that is renal. The conclusions are based on the time of the first appearance of the dye in the urine after intravenous injection, the intensity of the color, and the force and character of the ejected streams. Its sole disadvantage is that cystoscopy is essential.

Four centigrams (0.04 gm.) of indigo-carmin in either powdered or tablet form, are dissolved in 10 c.c. of freshly distilled water. This makes a 0.4 per cent. solution, which is injected intravenously, and the time noted. Immediately following the injection the cystoscope is introduced into the distended bladder, and the ureteric orifices carefully watched. In health the ejected stream appears as a forcible dark blue jet, but in disease the urine may dribble from the ureteric orifice, or the traces of color may be faint or entirely absent. Although the following phenomena are suggestive, they should not be relied upon exclusively:

The excretion of highly blue colored urine from both ureters in from three to six minutes or less signifies normal renal function.

Synchronous bilateral delay suggests parenchymatous or interstitial nephritis.

A pronounced delay on one side, with unusually early excretion from the other, indicates disease in the first instance and compensatory hyperactivity in the second.

Elimination commencing on one side from seven to twelve minutes after the intravenous injection, although within normal time limits from the other, suggests chronic pyelitis on the side delayed.

Elimination not beginning until from 12 to 18 minutes denotes partial ureteral obstruction or moderate impairment of renal function.

If the ureteral orifice is closely observed for twenty minutes and no indigo-carmine is ejected therefrom, practically complete ureteral obstruction or serious disease of the kidney may safely be assumed.

Dribbling instead of spurting from the ureteric orifice means loss of tissue tone or partial obstruction of ureter or renal pelvis.

The practical application of chromo-cystoscopy in gynecologic practice is almost self-evident, particularly as a method of differential diagnosis. Many a patient harboring a slightly cystic but harmless ovary, or a moderately diseased appendix, has been subjected to a laparotomy with disappointing results, because the pain which induced the patient to submit to operation was not relieved by it. A preliminary indigo-carmine function test would have demonstrated immediately the likelihood of a concomitant ureteral calculus or stricture, either one of which might have been responsible for the symptoms, rather than the other coexisting but relatively innocent lesion. For such reasons, and because this test consumes so little time and is so easily performed, some gynecologists have found it expedient to do it as a matter of routine before all elective abdominal operations.

Hunner has repeatedly called attention to the frequent incidence of ureteral stricture in women, and increasing experience in gynecologic work will soon demonstrate the correctness of his contention.

Other Renal Function Tests.—In addition to chromocystoscopy, several other renal function tests for the determination of the functional efficiency of one or both kidneys, and the estimation of the metabolic capabilities of the patient, have proved extremely useful to the clinician. Although their scientific exactness is questionable, they are valuable diagnostic

and prognostic aids, and fairly definite conclusions may be drawn from the proper interpretation of their behavior. The most reliable of these at the present time are the phenolsulphonephthalein, phloridzin, and cryoscopy of the blood.

Cryoscopy of the urine and the methylene blue test, both of which formerly enjoyed some popularity, are now almost obsolete. Others, such as experimental polyuria, electric conductivity of the urine, and the toxicity test, which have been advocated at various times, have never been widely used because their real worth is insignificant.

The chief value of renal function tests is diagnostic, and while one or more alone may not permit of correct judgment in any particular case, they are often of great assistance in completing the clinical picture. The phenolsulphonephthalein test is probably the most frequently used of all, because this agent is non-toxic and non-irritating, cystoscopy is unnecessary, and it is quite accurate for the determination of the functional efficiency and activity of the kidneys. The phloridzin test also enjoys a certain degree of popularity, notwithstanding the facts that the technic is cumbersome and phloridzin is but sparingly soluble in cold water.

Phenolsulphonephthalein Test.—Ampoules of phenolsulphonephthalein, containing approximately 1½ c.c. of the solution, can be purchased in the market. Each c.c. of this solution contains 6 mg. (0.006 gm.) of the dye. The patient is directed to drink 500 c.c. of water before applying the test to insure a free urinary secretion. Otherwise delayed time of excretion may be due to lack of secretion. A catheter is passed under aseptic precautions and the bladder completely emptied.

One c.c. of the solution is injected intramuscularly or intravenously, the latter method being preferred. Caution must be exercised to inject 1 c.c. only and not the entire contents of the ampoule. The intramuscular mode of administration constitutes the most prolific source of error in the interpretation of the behavior of the test, because of the variation of the time of absorption in different patients. On the other hand, by intravenous injection the medicament is injected directly into the blood stream. Its elimination is therefore more rapid and

the deductions therefrom are far more exact. Subcutaneous and intramuscular injections of the anilin dyes are quite painful and this unpleasant feature is also avoided by the intravenous route.

The time is noted when the injection is made, and the patient ordered to rest. If the dye has been injected intravenously, the contents of the bladder are collected by catheterization at the end of half an hour. If intramuscularly, the urine is collected at the end of one hour, and again in another receptacle at the end of the second hour. The half hour, or each hour, specimen is diluted with water to 200 c.c., and 10 c.c. of a 5 per cent. solution of sodium hydroxid added, which makes the urine decidedly alkaline and brings out the purple-red color. The specimen is then further diluted to 1000 c.c., and a small quantity placed in the cup of a colorimeter, for comparison with the standard (100 per cent.) solution in the other cup. Readings are then taken to estimate accurately the percentage amount of the drug eliminated. The color is not affected by the ordinary urinary pigments nor by pus.

In normal cases the time of the first appearance of phenol-suphonephthalein in the urine after intramuscular injection is from six to eleven minutes, and 35 to 60 per cent. is excreted in the first hour, and 20 to 25 per cent. additional in the second, a total of 60 to 85 per cent. When intravenous injection is practiced, the first appearance of the dye occurs in from four to six minutes, and 30 to 40 per cent. is excreted by the kidneys in half an hour. The drug is not necessarily eliminated in direct proportion to the excretion of water. Variations in the amount of water in normal cases may influence the concentration of the dye, but the quantity of the urinary output is immaterial.

In disease the renal permeability for this drug is decreased. The more the renal function is impaired, the greater will be the delay in the onset of excretion, and the less will be the quantity eliminated. Allowance must always be made for possible unilateral disease with compensatory hyperactivity of the other kidney, the sum total of which may closely approximate the normal. The absolute amount of work, as well as the relative proportion done by each kidney, cannot be ascertained by this

method, except by catheterizing each ureter and estimating the phenolsulphonephthalein content of the specimen from each side separately. This is a serious disadvantage in many cases, especially those in which ureteral catheterization is not feasible even if available, such as acute inflammation, ureteral stricture, etc.

Radiography.—Radiography is almost indispensable in uro-genital diagnosis and now precedes ureteral catheterization as a diagnostic step in most cases. It is particularly useful for the determination of enlargement of the kidney, distension or stricture of the ureter, distortion of the renal pelvis, tuberculous deposits, calculi, diverticulæ of the bladder, and new growths. The preliminary preparation of the patient is of paramount importance, because if this is not properly carried out, the gastro-intestinal contents are likely to obscure the uro-genital tract in the radiograph. The patient must be directed to eat a light supper only and take a generous dose of castor oil at bedtime, on the evening of the day before the pictures are to be taken. The following morning on arising she should take a copious enema of soap-suds, limit her breakfast to a single cup of coffee, and repeat the enema an hour later. The bladder must be emptied just before the exposure. Preliminary insertion of ureteral catheters impregnated with some metallic substance impervious to the Roentgen ray often aids materially in the diagnosis, especially in differentiating a ureteral calculus from phleboliths, enteroliths, and other calcareous deposits in the immediate neighborhood.

Pyelography.—Instead of introducing an x-ray ureteral catheter, the ureter and renal pelvis with its calices may be filled with some fluid material which is impervious to the x-ray. This accentuates the shadows and also increases the sharp delineation of the structures filled with the opaque substance. The patient can be easily prepared for pyelography by inserting the ureteral catheter, putting her in the Trendelenburg position, attaching the barrel and needle of a sterile glass syringe to the ureteral catheter, and filling the barrel of the syringe with the fluid material. The latter will run in slowly by force of gravity and the exposure is made when the flow ceases. This is a far

safer procedure than the old method of injecting under pressure. Collargol solutions were extensively used for this purpose for many years but have now been discarded. The most satisfactory solutions available at the present time are: 15 per cent. thorium nitrate, 15 to 25 per cent. sodium bromid, and 15 to 25 per cent. sodium iodide. All these are comparatively inexpensive, easily prepared, non-toxic, and flow readily. The bromide solutions are probably the least irritating.

The bladder may be distended with any of these solutions in the same manner for the purpose of outlining the viscus in the picture. These plates are called cystograms.

Ureteral Catheterization.—The catheterization of ureters is almost essential in some cases for diagnostic and therapeutic

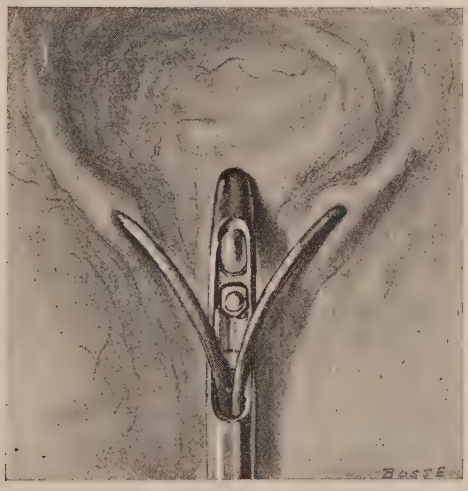


Fig. 43.—Brown-Buerger cystoscope, with ureteral catheters introduced into the ureters.

purposes. It is not an entirely innocuous procedure, however, for even in the hands of a careful and skilled cystoscopist unpleasant sequelæ may follow. If a positive diagnosis can be established without recourse to this method it is wise to avoid it. Ureteral catheters remaining in situ for any considerable period of time may cause a temporary hematuria or precipitate a renal colic. They also may traumatize the ureters

or transmit infectious material from the bladder to the kidney. Under no circumstances should a ureteral catheter traverse an infected bladder to invade a healthy ureter.

The indications for ureteral catheterization are:

For the collection of specimens to demonstrate differences in the constituents of the urine from each kidney.

For the collection of specimens from each kidney separately during a function test, to determine the absolute renal efficiency on each side. Incidentally, ureter catheterism may inhibit renal function, thereby influencing the test. The catheters must be of sufficient size to plug the ureters effectively, otherwise leakage of urine may occur along the catheter.

To act as a channel for the escape of urine from the renal pelvis, which has been retained by external pressure or a dilatable stricture.

For the determination of a partial or complete occlusion of the ureteral lumen.

To take measurements in the ureter by means of a graduated catheter.

For the introduction of substances impervious to the x-ray before radiography.

For the treatment of some diseases of the renal pelvis by instillations and irrigations.

For the diagnosis of calculi by means of a wax-tip ureteral catheter or bougie.

For the treatment of ureteral strictures by catheters, bougies, and wax-bulbs.

Before attempting to introduce a ureteral catheter or bougie, it is necessary to master the details of construction of the catheterizing cystoscope, and practice manipulation of the catheter and deflector. The following are the steps in the technic:

1. Distend the bladder with clear boric acid solution.

2. Assemble the instrument, connect the rheostat, and adjust the illumination of the lamp.

3. Put out the light by opening the thumb-switch and push the ureteral catheter through the catheterizing channel until the tip is concealed just within the distal opening.

4. Pass the cystoscope into the bladder and turn on the light by closing the thumb-switch.

5. Locate the ureteric orifice to be catheterized.

6. Push the catheter forward until the tip comes into view and traverses the entire field.

7. Turn down the deflector handle until the catheter points toward the ureteral opening.

8. Manipulate the catheter, deflector, and the cystoscope itself if necessary, to guide the catheter into the ureter. Elevation, depression, and lateral movements of the instrument may help.

9. After the tip has entered the ureter, push the catheter in a little at a time, steadily and with equalized pressure, until slight resistance is encountered.

10. In case both ureters are to be catheterized, the first may be disregarded when ready to proceed with the second.

11. If the ureteric orifice is lost from view, it must be relocated before any further steps are taken.

12. Turn the deflector handle back to its original position so that the guiding metal flap is flat, and put out the light.

13. To leave the catheters in place, push them in still further so that they curl up in the bladder. Gradually withdraw the cystoscope until the catheters appear at the external meatus.

14. Grasp the catheters at this point and pull the cystoscope away.

As a rule, the cystoscope may be left in the mid-line of the patient's body, but occasionally it may be necessary to align it with the angle on which the ureter enters the bladder.

It will sometimes facilitate matters to elevate the patient's pelvis.

When using the Brown-Buerger catheterizing cystoscope, the instrument should be introduced with the obturator in place. After this is withdrawn, the telescope is inserted and the bladder filled through small metal pet-cocks placed laterally on the shaft of the sheath. The catheters are threaded afterward.

Complement Fixation Tests.—These are now so generally accepted as useful diagnostic aids in cases of syphilis and chronic gonorrhœa that their practical value requires no

elaboration here. Recently, however, a similar test for tuberculosis has emanated from the laboratories, and while its technic has not been perfected nor its reliability assured, it undoubtedly promises much for the future, especially in cases of urogenital tuberculosis.

METHODS EMPLOYED IN MEDICAL TREATMENT

THE URETHRA

In the treatment of inflammatory conditions of the urethra a glass pipet of a greater diameter and length than a straight eye-dropper, and with a large bulb, is extremely useful (Fig. 44). When introduced half-way into the urethra, gentle pressure on the bulb bathes the posterior half of the mucosa, the fluid flowing into the bladder. As the tip is pulled out a slight distance, pressure on the bulb forces the fluid into the urethra, but it returns externally, bathing the anterior part of the urethra. When strong solutions are used, it is advisable to inject salt solution or some antiseptic solution into the bladder beforehand, to prevent the irritation of this organ by the silver

Fig. 44.—Glass pipet with fair sized rubber bulb employed for injecting various solutions into the urethra in the treatment of urethritis. Before injecting strong solutions into the urethra the bladder should be filled with some fluid to dilute whatever of the drug injected into the urethra may pass into the bladder.

fluids or strong solutions which may enter it from the pipet. Topical applications are easily made to the urethra through a Kelly endoscope.

Metal applicators with screw tips wrapped with cotton and dipped in various solutions may be introduced into the urethra (Fig. 45). Wooden applicators or those with smooth tips should never be used for urethral or intravesical applications, as the cotton may slip off and become lost in the bladder. Better still, the tip of a Braun intrauterine syringe is covered with cotton and introduced into the urethra. The fluid in the barrel is then injected and the cotton becomes saturated with the medicament. The tip may be withdrawn and the cotton may be left *in situ* for any desired length of time.

In some cases of urethral involvement it is necessary to dilate the urethra, and to follow the dilatation by local applications.

Hegar dilators, such as are used for dilating the cervix, are useful for this purpose. Preliminary dilatation of the urethra is sometimes necessary before instrumentation, and this is best accomplished by Kelly's conical urethral dilator. It fulfills the indications nicely, as the external urinary meatus is the narrowest part of the canal. Any instrument that will pass this point will not be obstructed further in, except in the case of stricture.

In the treatment of chronic conditions it is sometimes necessary to introduce into the urethra medicated pencils or bougies made of a base consisting of cacao-butter or cacao-butter and talcum, or glycerin.

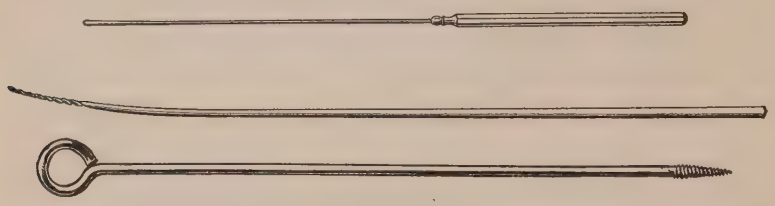


Fig. 45.—Metal applicators to be covered with a thin layer of cotton for applying various solutions to the urethra when long contact of the solution with the urethral mucosa is desired.

The urethra may be irrigated by injecting fluids directly into the bladder without the aid of a catheter. The syringe is protected by a rubber tip, and this procedure can be readily carried out. The patient may pass this fluid, and thus the urethra is again washed with the desired medication.

In very chronic cases, where the tubular endoscope is needed for diagnosis, topical applications or cauterization may be made to the involved areas directly through the instrument.

THE BLADDER

In the treatment of involvements of the bladder, irrigations, instillations, vaccines, electrotherapy, and topical applications are used. Irrigations are easily carried out by the use of rubber catheters with trumpet-shaped outer ends or female metal catheters. A large piston syringe made of glass, with or without metal trimmings, and containing several ounces is all that is needed (Fig. 46). With such a syringe the fluid can be

injected under varying degrees of pressure. By removing the syringe from the catheter the fluid is readily drained out. Another advantage of the piston syringe is that its use enables us to gage the capacity of the bladder, and in the treatment of chronic cases of "contracted bladder" steady pressure can be

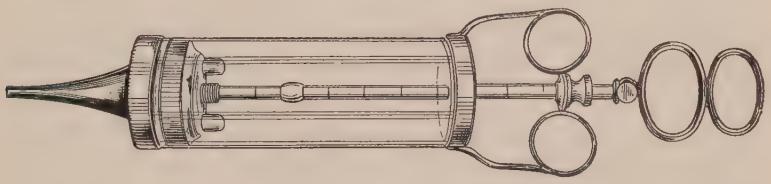


Fig. 46.—Piston syringe used for injecting fluids through a rubber catheter into the bladder for irrigation or treatment. With it, the amount injected can be controlled and varying degrees of force can be used for distending the bladder, a procedure which is often of therapeutic importance, especially in the case of "shrunken bladder."

used to distend the bladder (Fig. 47). By increasing the amount of fluid injected at each sitting, in the course of weeks or months the capacity of the bladder can sometimes be very much increased. The piston syringe gives us the opportunity

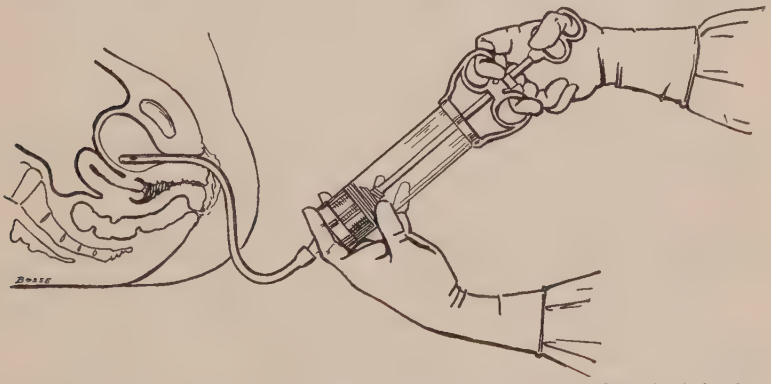


Fig. 47.—Piston syringe connected with rubber catheter after the injection of fluid into the bladder. The trough of the table, pictured in Fig. 1, catches the fluid as it flows out through the catheter.

to judge accurately the amount of fluid injected. Such glass syringes can be readily kept clean and sterilized. Instillations can be made with this syringe and a rubber catheter, or with the glass pipet introduced through the urethra into the bladder. The bladder may be irrigated with the aid of a glass funnel

attached to a rubber tube, using then a rubber or metal catheter. Another simple method of introducing fluids into the bladder consists of connecting the tubing from a Valentine irrigator to the catheter. If the reservoir is graduated, the amount of fluid required to distend the bladder can be estimated without difficulty.

Topical applications in the treatment of solitary ulcers or single or multiple tubercular foci, or for the painting of the trigone alone, usually demand the use of the Kelly cystoscope.

High frequency electricity is the most satisfactory and efficient method of treatment for the majority of bladder tumors.

GLANDS OF THE VULVA AND URETHRA

These are numerous small glands in the vulva, especially about the urethra, in the vestibule, and in the fossa navicularis, which when infected secrete a purulent or mucopurulent discharge, without definite tumefaction.

These are infiltrated, swollen, suppurating follicles which must be destroyed with the silver stick or the actual cautery. They are frequently present in chronic gonorrheal vulvitis and often escape attention.

In the treatment of infections of the glands of Skene, a hypodermic needle and syringe are used, the needle having a smooth dull tip. It is introduced into the duct and various silver salts or a few minims of pure carbolic acid may be injected. If this fails to relieve the condition, the urethra should be dilated, the ducts split open and cauterized with acids or with the cautery. Such treatment can usually be carried out under local anesthesia.

Bierhoff has devised a fenestrated endoscopic tube, the slit being 2 mm. wide for opening paraurethral passages situated near the external meatus. It is inserted so that the fenestrum lies directly over the orifice of the infected duct. The tube in this way protects the remaining circumference of the urethral wall (Fig. 48).

The knife is inserted into the duct, and it may be slit along its whole length without danger of injuring the rest of the urethral

wall, or else a fine probe may be passed into the duct and incision made upon it.

The tube is introduced with the obturator in place. On withdrawing the obturator the opening of the duct is brought into the slit and then the incision is made.

Treatment is often necessary in the involvements of the ducts and glands of Bartholin. If it is desired to use applicators, the outer opening of the duct must be incised under cocain or novocain. After this has healed, local applications to the duct or injections into the gland may be made. In chronic cases which do not yield to treatment, the gland may be injected

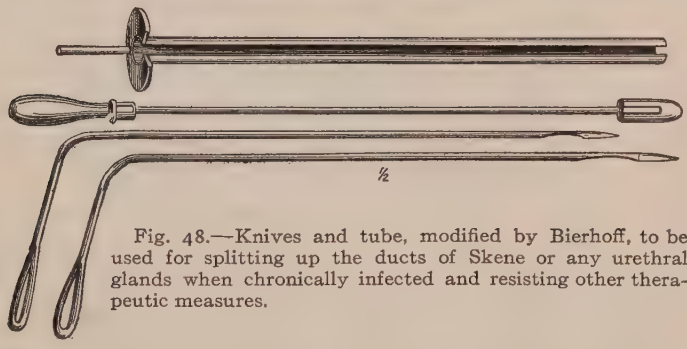


Fig. 48.—Knives and tube, modified by Bierhoff, to be used for splitting up the ducts of Skene or any urethral glands when chronically infected and resisting other therapeutic measures.

with solutions with the aid of a hypodermic needle, the needle being introduced straight into the gland through the vulvar mucosa without passing through the duct.

In abscess of the gland, free incision is made, followed by irrigation and cauterization to destroy the so-called pyogenic membrane. Iodoform packing is used and kept in place by sutures. Healing generally takes place. In chronic swelling of the gland and in cysts of the gland of Bartholin the whole glandular structure must be excised. This should always be done under general anesthesia, as venous bleeding is usually free, and difficult to control. Hemostosis must be complete, to prevent the formation of a hematoma.

THE VAGINA

Treatment of the vagina may be carried out by the use of medicated vaginal douches, by bathing with the aid of the

Ferguson speculum, by introduction into the vagina of medicated tampons, or by the application of drugs with the aid of other specula.

Douches.—Douches may be of various temperatures and contain any of the various cleansing, antiseptic, astringent, or soothing solutions. Cool temperatures are usually to be used in acute inflammation, tepid in subacute, and warm or hot in chronic involvements of the vagina. The drugs used are healing lotions or antiseptic fluids, or astringent remedies.

Fig. 49.—Glass douche tips to be attached to the tubing of a fountain rubber bag when taking vaginal douches.

Douches are especially useful in the acute stages of vaginal inflammations, and are now in general use for cleansing purposes and to aid in the correction of vaginal and cervical irritations. Their best purpose is to supplement local treatment by the Ferguson baths.

In the use of the douche, glass tips or tubes are desirable (Fig. 49). The douche is best taken in the recumbent position, especially if the effect of temperature is desired. The patient should then lie quietly for fifteen minutes to one-half hour. To be efficient, the fluid must come in contact with all parts of the vaginal wall, and the walls must be distended. It is therefore of advantage to direct the patient to compress the labia gently around the douche nozzle as the fluid runs in. The douche should not be given at too high a pressure. When taken hot, it is of great service in many cases of excessive bleeding and in stubborn inflammation of uterus and adnexa. Ordinarily, one or two douches a day suffice, but in some cases they may be required at more frequent intervals. In acute cases, as many as six douches each day may be necessary.

If the patient is careful and cleanly, a douche with tepid water during menstruation is not contraindicated.

Ferguson's Speculum.—At least three different sizes of Ferguson specula, of a length of 12 cm., should be at hand. An

internal examination should precede the use of the speculum in order to judge the size and length of the vagina and the size and resistance of the introitus (Fig. 50).

The speculum, well sterilized and lubricated, should be taken in the right hand. The left hand separates the labia minora. With the aid of the thumb and two first fingers this manipulation gives a distinct view of the remains of the hymen, vestibule, and periurethral glands, the urethra and the fossa navicularis. The point of the speculum is introduced with pressure against the posterior vaginal wall and perineum so that the urethra is not compressed (Fig. 51). With a slight rotary

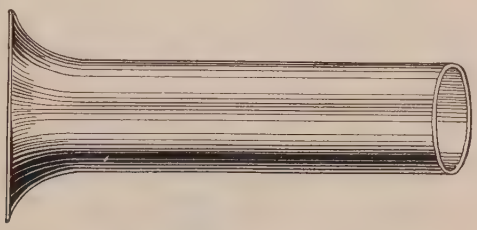


Fig. 50.—Ferguson speculum for clear examination of the cervix and vagina, for giving vaginal baths and applications. Through it the cervix may be scarified or ovula of Naboth may be opened. Through it the long vaginal tampon (Fig. 64) may be introduced. When the speculum is drawn out slowly, the vagina may be dusted with powder with the aid of the powder-blower (Fig. 65). Into its outer end the large bulb (Fig. 13) may be firmly introduced and a powerful suction action may be exerted on the cervical and uterine canals or a marked uterine hyperemia may be produced (Bier's hyperemia).

movement of the speculum it is pressed forward in a horizontal position, but as the tip enters the vagina itself it is directed downward.

The vaginal walls may be inspected as the speculum is being introduced, or else the cervix is first brought into the field of view and the vaginal walls are examined as the speculum is drawn forward.

The anterior and posterior vaginal walls lie close together, and are being spread by the introduced speculum. Hence, a very good view is given as this instrument is being introduced. The cervix appears smaller in this speculum than it does in the bivalve, and cervical tears appear less extensive than they really are.

No intrauterine manipulation should be attempted with this speculum. It is used chiefly for the examination of the vagina and the vaginal portion of the cervix. With this speculum

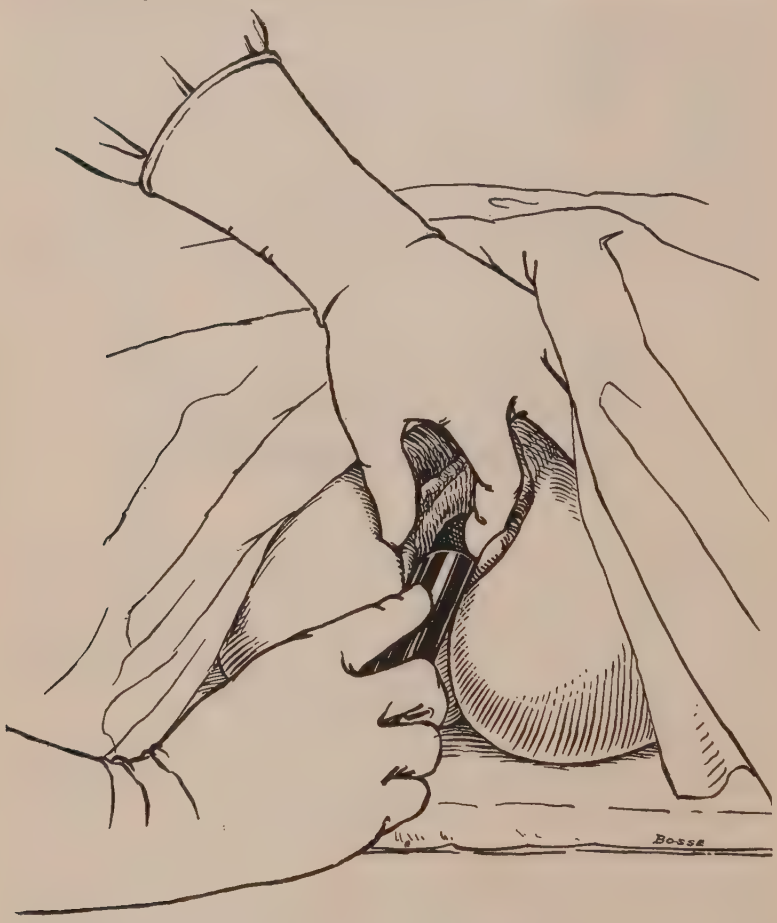


Fig. 51.—The method of introducing the Ferguson speculum. The speculum is well lubricated. The labia are separated by the thumb and index-finger of the left hand. The tip of the speculum is placed on the posterior wall of the vaginal opening, the speculum being held at the angle indicated. The tip of the speculum is pressed down firmly on the posterior vaginal wall and by a gentle rotary motion the speculum is introduced into the vagina. The diameter of the speculum must be fitted to the size of the vaginal outlet as determined by the condition of the perineum and the levator ani muscles.

however scarification of the cervix can be done, ovula of Naboth may be opened, and drugs may be applied to the vaginal portion of the cervix.

A Ferguson speculum introduced into the vagina discloses the cervix, and when gradually drawn out gives a clear picture of the vaginal mucosa. During this manipulation the vagina should be washed and thoroughly dried. One great advantage of the Ferguson speculum is that it permits the cervix or the upper part of the vagina to be bathed without touching, if so desired, the lower part of the vagina (Fig. 52). When firmly introduced and pushed into the fornices, fluid is poured into it

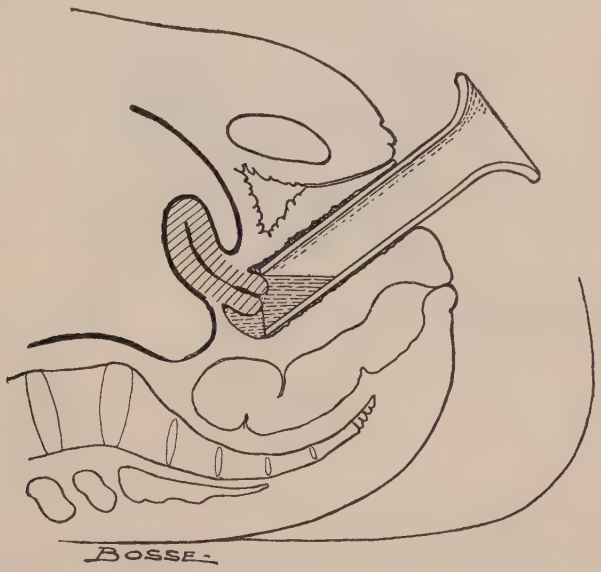


Fig. 52.—Half section showing the Ferguson speculum in place with fluid poured into it. Only that part of the vagina and cervix seen beyond the tip of the speculum is touched by the fluid introduced. The cervix only can thus be bathed if desired.

and the cervix is thoroughly bathed. If the speculum is held firmly, none of the fluid finds its way between the speculum and the vaginal wall. The fluid is then poured out by depressing the outer end of the speculum and drying the cervix with cotton. If it is desired to bathe the whole vagina, the speculum is gradually drawn out close to the perineum or to the outer end of the vagina, by which manipulation the vaginal wall is stretched, folds are opened out, and every bit of the surface comes in contact with the medicament. During this procedure the outer end of the speculum is lifted up so that the speculum

is at an angle of 45 degrees to the table (Fig. 53). By depressing the outer end of the speculum, after it has again been pushed up into the fornices, the perineum and anus are kept free from the solution as it runs out of the speculum (Fig. 54).

I have used a Ferguson speculum made of the form and size of the various Kelly cystoscopes, but without the handle, for

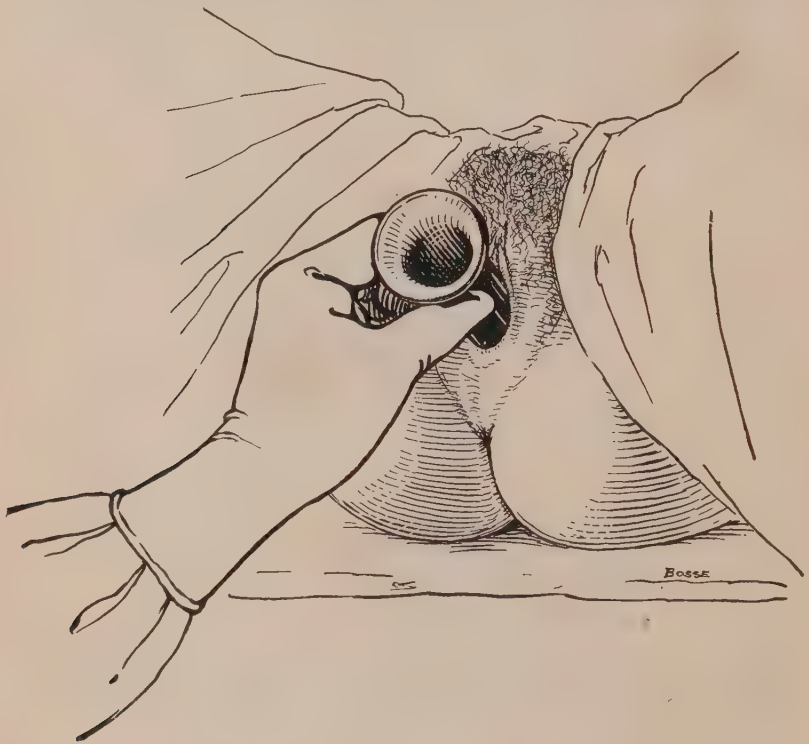


Fig. 53.—Angle at which Ferguson speculum is held and drawn out, after the fluid has been poured into it, in order to bathe the entire vaginal canal thoroughly. The speculum is drawn out and pushed in several times.

examining the vagina and portio in infants and children, and for the purpose of giving them vaginal baths with the various silver salts (Fig. 55). The vagina of children is best irrigated by introducing a rubber urethral catheter, to which is attached the tubing of a fountain syringe, Valentine irrigator, or piston syringe. By this method, if the two halves of the vulva are brought together by the thumb and first finger of the hand, the

vagina is distended, the folds are opened out, and a thorough cleansing and medical application is made. The same method of examination and treatment applies in the case of virgins. No injury to the hymen occurs in either case. In the treatment of the vagina of children straight or curved eye-dropper pipets can be used without injury to the hymen.

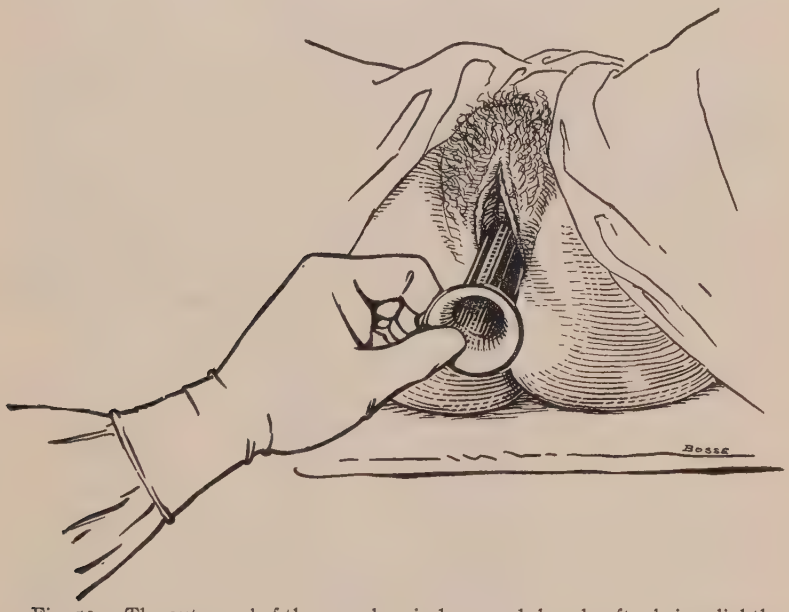


Fig. 54.—The outer end of the speculum is depressed sharply after being slightly drawn out, and the fluid used is poured out either into the trough of the table or into a vessel held under the speculum.

The Sims speculum (Fig. 56) is used with the patient lying on her left side in the so-called Sims position. The patient lies on a table, bed, or sofa on her left side, with the left arm hanging over the left edge of the table and the thorax turned toward the table surface; the knees are bent and flexed sharply and drawn up, the right one higher than the left; the buttocks are near the edge of the lower left corner of the table. The large labia are drawn up by an assistant, and the physician introduces one or two fingers into the vagina back of the cervix. On this finger or between these two fingers the proper end of the speculum is introduced, and then turned so that its tip passes

toward the hollow of the sacrum. The assistant takes hold of the other end and pulls it backward, pressing on the perineum. Air enters the vagina and distends it. The anterior vaginal wall is held back by a depressor, and if a volsellum is introduced and the cervix is grasped by it, an excellent view is obtained of the cervix and fornix.

Fig. 55.—Tiny vaginal Ferguson speculum for use in infants and small children, for the purpose of examination and treatment of the vagina and portio in gonorrheal vulvovaginitis. This procedure is the same as in adults and no harm is done to the hymen. It may also be used in the urethra of the adult female.

An objection to the Sims speculum is that its use implies assistance; hence, the bivalve usually is better. In occasional cases of retrodisplacement of the uterus it is difficult to get the cervix into view with a bivalve speculum and a Sims speculum with the Sims position is helpful.

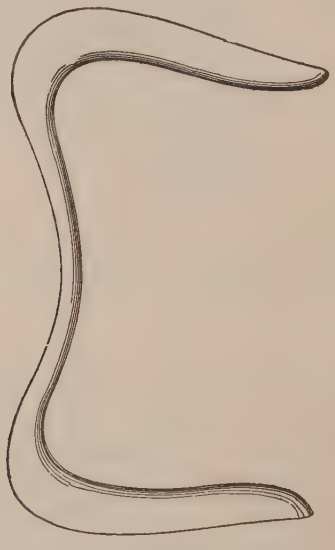


Fig. 56.—Sims speculum. Its use, as a rule, implies the aid of a nurse or other assistant.

Bivalve Speculum.—In introducing the bivalve speculum the labia are held apart by the fingers of the left hand (Fig. 57). The speculum is introduced with the blades closed, the blades looking to the right and to the left. Before introduction the

blades should be smeared with lubricant. When introduced in this position, about one-half of their length, they are slowly turned so that the blades look up and down and are parallel to the anterior and posterior walls of the vagina. The outer end of the speculum is then elevated and the inner end is depressed firmly downward so that the tip of the speculum passes back of the cervix into the posterior fornix. The blades

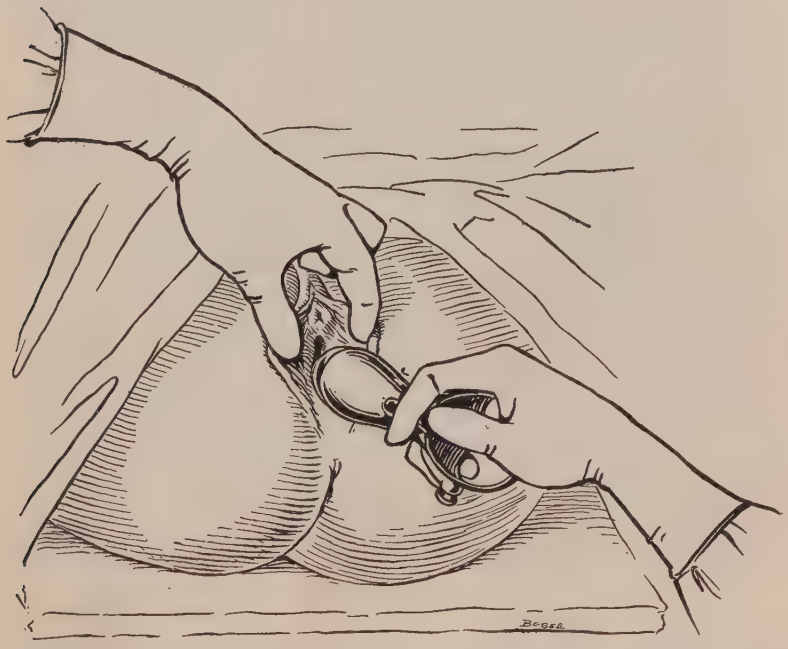


Fig. 57.—In introducing the bivalve speculum the labia are separated by the thumb and index-finger of the left hand; the right hand holds the speculum as indicated. The blades are close together and, covered with lubricant, are introduced so that the upper edge does not press against the urethra. When introduced as far as the two fingers held on either side of the two blades permit, the speculum is turned so that the blades lie in a horizontal plane. The outer end of the speculum is then elevated so that the tip of the blades passes under the cervix. They are then separated.

are separated a slight distance, and at the same time the outer end is depressed and drawn slightly outward, so that the upper one may slip over the tip of the cervix into the anterior fornix. The screw is then turned until the blades are far enough apart to give a good view of the cervix and the fornices (Fig. 58).

Abel's speculum (Fig. 59) is helpful when doing an intrauterine packing, especially in abortion, in order to keep the gauze from contact with the external genitalia and the vulva.

Garrigues' weighted speculum is of aid in doing a curettage, for no assistance is needed to hold the posterior speculum in place, and the operator holds either the anterior speculum or

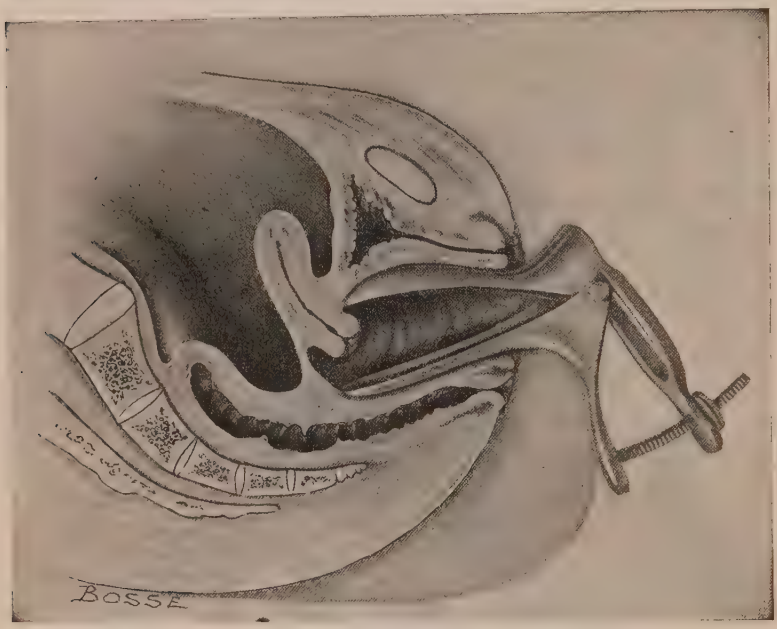


Fig. 58.—Bivalve speculum in place. Through it the cervix is seen, ulcers, erosions, or new-growths of the portio are observed, and the color and character of the cervical discharge are noted. Through the bivalve speculum suction can be exerted with the tube and bulb of Fig. 12, and then cervical and uterine smears for microscopic examination are made. The sound may be introduced, intracervical and intrauterine applications and irrigations can be carried out, intrauterine electrodes can be introduced, scarification of the cervix can be done, test excisions from the cervix and test scrapings from the uterus can be obtained, and vaginal packing with glycerin and gauze or with powders and gauze can be carried out.

the volsellum with the left hand. Edebohls' speculum, with a small pail attached, is very serviceable (Fig. 60).

Tampons.—Tampons are made of cotton or wool or wool covered with gauze. A piece of cotton or wool of the desired size is selected and tied with a piece of string. The tampon is then doubled on itself and the free ends are immersed in glycerin, ichthyol-glycerin, iodine-glycerin, medicated lanolin, or any

other medicament, and passed through the speculum with the aid of a long dressing forceps (Fig. 61) up to or around the cervix. Tampons are used either to apply drugs to the cervix, to apply glycerin for its depleting effect, to support the uterus, or to stretch the posterior fornix, the utero-sacral ligaments, or

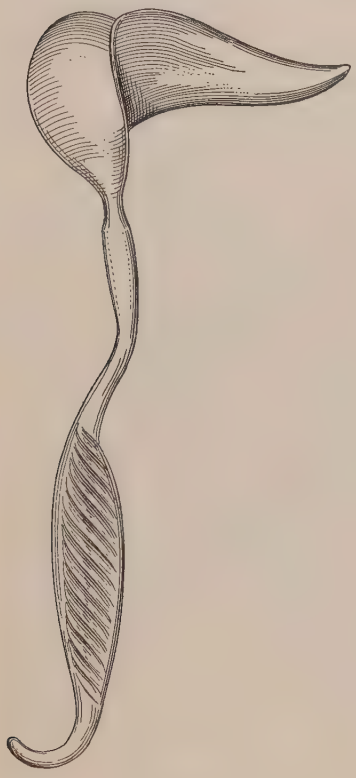


Fig. 59.—Abel's speculum. Its broad lateral flanges completely cover the labia. When packing the cervix and uterus with gauze, it prevents the sterile gauze from coming into contact with any part of the labia or vulva and thus insures perfect asepsis.

Fig. 60.—Edebohls' self-retaining speculum, which is of great service when performing curettage or intrauterine packing without assistance. The pail, partly filled with water, serves as the weight to keep the speculum in place and catches the fluids and scrapings.

adhesions in the cul-de-sac of Douglas. Generally one is introduced covered with medicated glycerin, and a dry one is introduced after it to keep the first one in place. Two, three, or four of such small tampons may be introduced into the posterior

fornix and anterior fornix, and then kept in place by a large one introduced after them or by gauze packed into the vagina. The strings about the tampon are made long enough to extend out of the introitus so that they may be removed by the patient at the end of twelve or twenty-four hours.

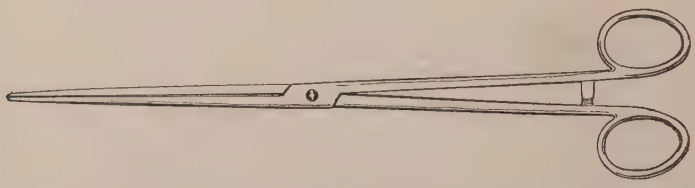


Fig. 61.—Dressing forceps of proper caliber and curve. It is used in any and all of the procedures implied in the treatment of the cervix and vagina with the aid of the bivalve or Ferguson specula. It is also introduced into the uterus when packing with gauze.

Wool tampons are more elastic than cotton and give better support to the uterus. One or more wool tampons covered with the desired medicament may be used, or one long strip,

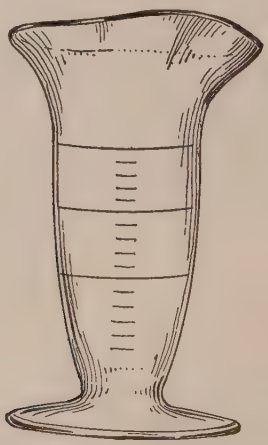


Fig. 62.—Measuring glass used in pouring glycerin into the bivalve speculum and in pouring any desired solution into the Ferguson speculum.

with a string tied about it, of a size sufficient to be packed in the fornices and to fill the vagina may be employed. This wool is often irritating, so that it is wise to cover it with a layer of gauze.

Instead of using several tampons, each separately tied by a string, we may use two, three, or more tampons, attached to

each other at various distances by thread or string and packed in one after the other. They are easily removed by pulling on the string of the last one.

Fig. 63.—Introducing gauze, with dressing forceps, into the fornices of the vagina and into the vaginal canal. The posterior fornix is especially well packed with a long strip of gauze. Then the anterior fornix is packed with another strip. Then the upper and middle thirds of the vagina are gently but firmly packed with the unused halves of the two long strips. The screw which opens the blades of the speculum is then loosened entirely. The dressing forceps press the gauze upward as the speculum is being drawn out. The speculum is gradually rotated so that the blades lie against the lateral walls of the vagina. Thus pressure against the urethra and rectum by the separated blades is avoided on removing the bivalve.

In most cases I have discarded the use of cotton or wool and use gauze instead; soft gauze in strips 6 or more inches wide and of any desired length meets the requirements. The desired glycerin mixture is poured into the speculum (Fig. 62) and one

long strip of gauze is packed gently but firmly into the lateral and posterior fornices and the unused end is allowed to hang out over the posterior wall of the speculum. Another strip, somewhat shorter, is then packed into the anterior fornix (Fig. 63). Then the two unused portions are gently but firmly introduced together into the upper part of the vagina, and loosely into the lower half of the vagina. This packing is held in place by pressure with dressing forceps as the speculum is removed. The advantage of this method of treatment is firmer support to the uterus, excellent stretching effect on

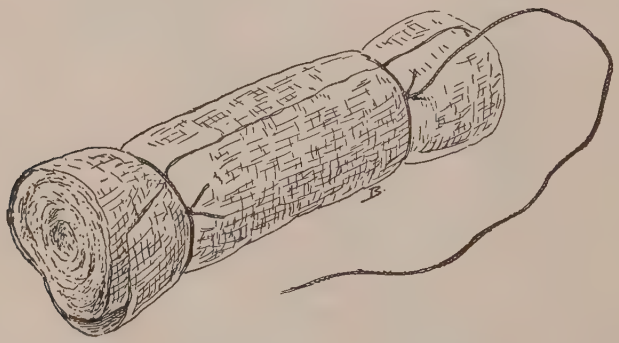


Fig. 64.—Long vaginal tampon, made of cotton covered with sterile gauze, to be introduced into the vagina through the bivalve or, better, through the Ferguson speculum. This tampon when dusted with powder is of great aid in applying any dry medicament to the vaginal walls and in keeping them dry.

sclerosed bands in the posterior fornix and on the cul-de-sac of Douglas, and free drainage of the serous effusion produced by the glycerin.

Tampons introduced into the vagina are generally applied about the cervix and in the fornices to permit of medication of the cervix and its canal and to exert a depleting or dehydrating action on the pelvic organs. Tampons intended for the treatment of the vagina itself consist of cotton rolled to any desired diameter and cut off to a length a little less than the length of the vaginal canal. This is then covered by two or three layers of gauze and a string is tied about either end to keep the gauze in place. The string at one end is left long enough to permit this tampon to be pulled out (Fig. 64). If such a tampon be dusted with various powders and introduced into the vagina, preferably

through a Ferguson speculum, it keeps the drug in constant contact with the vaginal mucosa and keeps the vaginal mucosa dry.

The vagina may be packed throughout its whole length with bichlorid gauze, with iodoform gauze, or with gauze soaked in any of the silver salts, in astringent solutions, or any other medicament. Powders may be blown into the vagina through any of the specula (Fig. 65).

Volsella, or tenaculum forceps, are used to grasp the anterior or posterior lips of the cervix (Fig. 66). If one is applied to either lip, it brings the cervix into a position where we may judge whether a red irritated area is a part of the cervical canal or whether it is external to the cervical canal and so constitutes an erosion.

The volsella are also occasionally used to grasp the cervix to steady it for the introduction of the sound. By pulling on

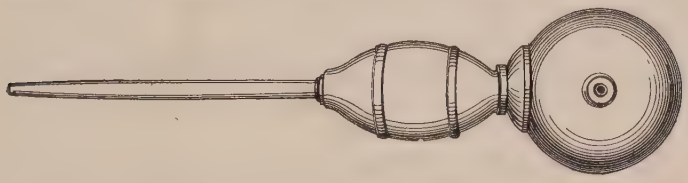


Fig. 65.—Powder-blower, for blowing powders into the vagina, which is best done through the Ferguson speculum. As the speculum is slowly drawn out, every bit of the exposed cervix and vaginal walls is covered with powder.

the volsella the cervix is drawn down and the fundus is pulled back if in anteflexion or forward if in retroflexion, and into a uterus thus straightened out the sound may be more readily introduced.

This instrument is also used to steady the cervix and to lift it up to permit of the introduction of gauze or Playfair sounds or medicated pencils into the uterus and to permit a more thorough packing of the posterior fornix with gauze.

It is of value in pulling down the cervix, when making a bimanual examination, to determine the relation of the uterus to a pelvic tumor which may belong to the uterus or to the ovary, or which may be of an extrauterine nature.

Tugging on the cervix by a volsella is contraindicated in all inflammatory conditions of the adnexa, with peritoneal adhesions and in the presence of all pyogenic infections.

Scarification.—The withdrawal of blood from the cervix and uterus by scarification is sometimes indicated in cases of chronic fibrosis and congestion of the uterus, and in cases where the preliminary uterine and pelvic congestion, when associated with a delay in the outflow of the blood, causes intense and excruciating pain and colic which lasts until the outflow of blood is established.

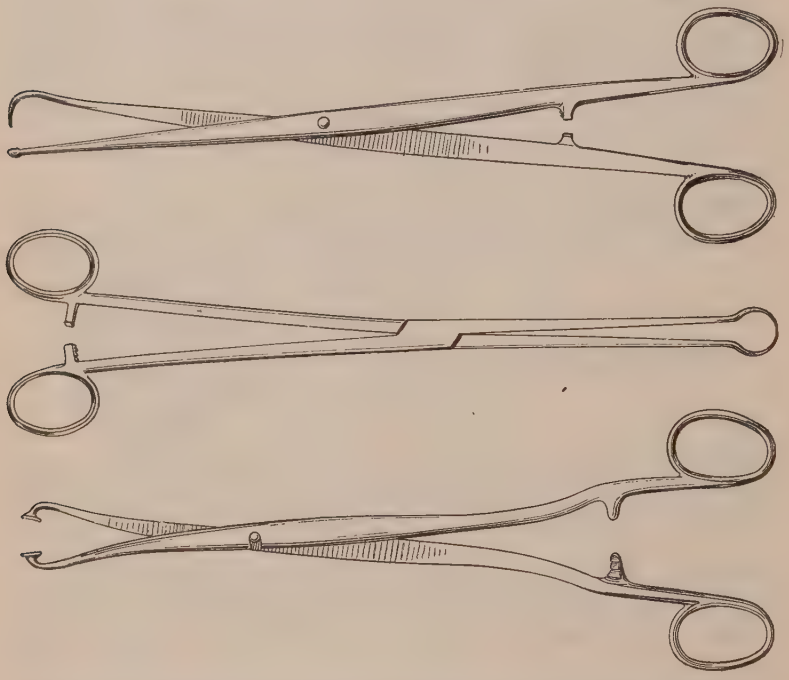


Fig. 66.—Tenaculum forceps of various forms, for grasping the cervix, holding it firmly and pulling it down while performing any intrauterine manipulation or packing the posterior fornix or while making a bimanual examination. In a bimanual examination it is sometimes of aid to pull the uterus down by a volsella and determine its relation to a pelvic tumor.

Scarification may be done with the aid of the bivalve or Ferguson speculum, the vagina and cervix first being thoroughly cleansed. Two or three stabs may be made with the scarificator to a depth of 1 cm. Blood up to the amount of one ounce may be withdrawn from patients who are not anemic. Then a tampon soaked in iodine-glycerin or tannin-glycerin should be

introduced, or, better still, the upper part of the vagina should be thoroughly packed with iodoform gauze.

INTRAUTERINE THERAPY

Intrauterine therapy is practised by some, with the use of cotton rolled in a thin layer on very thin metal applicators; by others, drugs are introduced into the uterine cavity by the Braun or Ultzmann intrauterine syringe (Figs. 67 and 68)

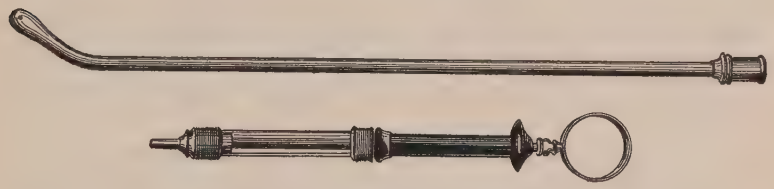


Fig. 67.—Braun intrauterine syringe, for injecting fluids into the uterus. When the tip is covered by a layer of cotton, firmly applied, the drug is injected after the tip is introduced into the uterus. The cotton becomes impregnated with the solution and is evenly applied to the mucosa. No free fluid enters the uterine cavity and contractions of the uterus cannot force any fluid into the tubes. The cervical canal must be well dilated before using this syringe. The same procedure is applicable to the urethra.

covered with cotton, as in the case of the intrauterine applicator.

In making intrauterine injections with a syringe, contraction of the uterus may cause uterine colic or may force the fluid into the tubes. The cervix, and especially the internal os, must be

Fig. 68.—A modification of the Braun intrauterine syringe, with numerous lateral openings at the tip of the cannula. (It can be used in the same manner in the urethra.)

wide enough to permit of thorough drainage. Hence, in order to avoid contraction of the uterus and the forcing of fluid into the tubes, it is wiser to use Playfair or other applicators covered with cotton and dipped in the desired medicament (Fig. 69). These cotton-covered applicators are allowed to remain in the uterus for a few seconds. If, however, the internal os is not sufficiently wide, and if the applicator is not quickly introduced,

very little of the drug comes into contact with the uterine lining. Hence, it is better if this method of treatment is desired, to use the Braun syringe covered with cotton, the drug being injected only after the syringe tip has been introduced into the uterus. The fluid simply moistens the cotton and the desired end is attained without danger (Fig. 70).

The uterus may be treated by introducing into its cavity medicated pencils containing the various drugs in a base of cacaobutter, etc.

Intrauterine applications must be preceded by thorough dilatation of the cervix. This may be easily done by dilating the cervix with intrauterine electrodes, applying 6 to 12

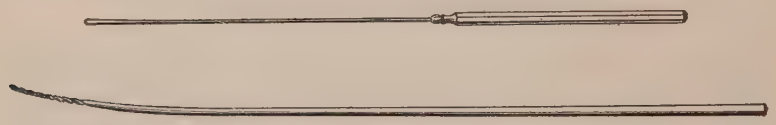


Fig. 69.—Applicators which, when covered with a layer of cotton, and dipped into various solutions, are used for making intrauterine applications.

milleamperes of the galvanic current. The negative pole wire is connected to the intracervical electrode, and the positive pole wire to a flat felt-covered copper plate electrode, which is placed in contact with the skin on the suprapubic or sacral region. By using electrodes of various sizes, larger ones can be introduced every three or four minutes as the cervix softens. The cervix may also be gradually dilated by applicators covered with cotton soaked in lysol or covered with sterile vaselin and introduced in increasing size, after which a thin wick of iodoform gauze is introduced into the cervix and allowed to remain in place for twenty-four hours, being kept in place by vaginal packing. Several treatments of this nature are enough to dilate the cervix sufficiently to permit of intrauterine applications.

Another method of dilating the cervix is by the use of sterilized tupelo or other tents kept in place for twenty-four hours. Their action in dilating a cervix is certainly excellent, but they often produce extreme pain, so that their use in ambulatory practice is not feasible, nor is it advisable. This method is almost obsolete.

Another method is to use the smallest size of uterine sound, then a larger size, leaving each in place for a minute. We then continue with Weir's sounds bent to the proper curve, using them in succession up to the desired size.

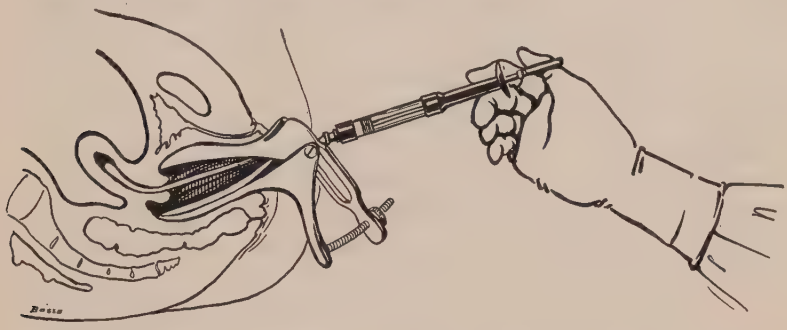


Fig. 70.—Half section showing the method of using the Braun intrauterine syringe.

Except for negative galvanism, these methods of dilating the cervix, to permit of intrauterine therapy, have little to recommend them. They are dangerous if intrauterine therapy is intended for inflammatory conditions of the uterus. We are then dealing with a cervix and a uterus containing microorganisms, and the risk of causing a pericervical inflammation or lighting up an extension of an intrauterine inflammation is certainly great.

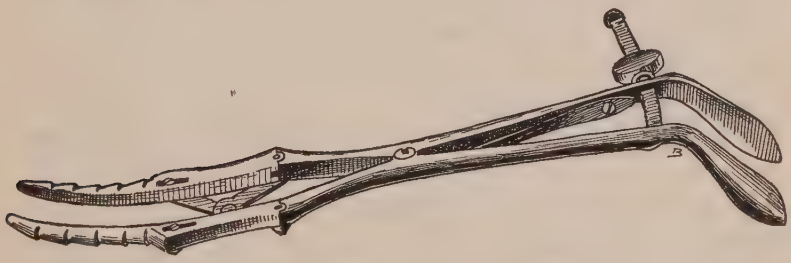


Fig. 71.—Goodell's glove-stretcher dilator, for dilating the cervix. This must be used gently, with constant relaxation and rotation of the blades. When used vigorously or allowed to slip out while the blades are being separated, it may cause deep tears into the cervical wall and into the broad ligament, which may not be recognized.

The old method of dilating the cervix by sounds or by applicators wrapped in cotton and dipped in antiseptic solutions or in

sterile vaselin, or the introduction of stem pessaries into the cervix, is perhaps justified in making the diagnosis of cervical stenosis or obstruction as the cause of dysmenorrhea, and in overcoming such obstruction when it is considered the cause of dysmenorrhea or sterility. It should then be done with the greatest care, and only when intrauterine and intracervical infection of any form can be absolutely excluded.

Dilatation of the cervix under anesthesia by dilators of the glove-stretcher variety (Fig. 71) or, better still, by the graduated Hegar dilators is a step necessary preliminary to curettage (Fig. 72). It is also a proper procedure as a preliminary step in the hands of those who wish to administer intrauterine treatment

Fig. 72.—Hegar graduated dilators, for dilating the cervix without the associated risk of tearing the cervix. They produce an even dilation. In five to ten minutes the cervix can be dilated sufficiently to admit the index or middle finger.

by intrauterine irrigation or by packings with protargol or other silver salts, or by irrigation plus curettage followed by packing with silver salts. While the value of curettage and intrauterine packing in the treatment of uterine gonorrhea is extremely doubtful, it at least does away with continued irritation and tinkering with an infected cervix, which procedure is not infrequently the cause of varying degrees of pelvic inflammation. Medicated bougies containing silver salts or ichthyol, etc., are used by some for treating inflammatory conditions of the cervix and uterus.

Intrauterine Irrigation.—In performing intrauterine irrigation a double-running catheter of metal should be used. The anterior half of the **Fritsch-Bozeman** irrigator (the safest) consists of an outer tube with an opening on the under surface of its lower end. The tip of the tube is solid, but one-half inch from its tip there is on either side a fenestra two inches long. Within this outer tube there is a much smaller tube, which by

no means fills the lumen, and which extends almost to the end of the outer tube (Fig. 73). The fluid runs in through the inner tube and enters the uterus through the lateral fenestræ at the anterior end of the outer tube. The fluid re-enters these fenestræ and enters the lumen of the outer tube and is poured out through the opening on the under surface of the lower end of the

Fig. 73.—Fritsch-Bozeman double-running intrauterine irrigator. It is obtainable in different sizes. Fluid should be allowed to run out of it before it is introduced into the uterus. The cervix must first be dilated. The uterus is sometimes irrigated before and after curettage.

outer tube. By moving the tip of the intrauterine irrigator up and down, all parts of the uterine cavity are thoroughly irrigated, and no intrauterine pressure by the injected fluid is exerted so long as the opening on the under surface of the anterior half remains outside of the cervix. With this instrument, of a sufficiently small caliber and of the proper curve, the

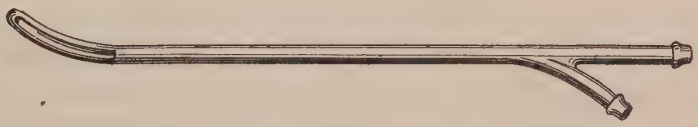


Fig. 74.—Small-calibered double-running intrauterine irrigator, for irrigating the uterus in office practice (a procedure requiring the greatest care). It is practically a modification of the Fritsch irrigator.

average uterus may be irrigated with small or large amounts of any desired fluid. Naturally enough, this procedure implies a preliminary dilatation of the cervical canal, not alone to permit of the introduction of this irrigator, but also to permit of ready drainage of the uterus. Such an intrauterine irrigation is sometimes done before and after curettage of the uterus. In office practice an intrauterine double-running irrigator of small caliber and of the form of Fig. 74 is very useful.

Curet.—The curet finds a legitimate field for use in the removal from the uterine cavity of foreign substances, such as

secundines, or placental remnants, and in the removal of overgrowths of the endometrium in the form of polyps or hyperplastic endometrium, or overgrown endometrium left behind as decidua after abortion in the early stages (Figs. 75 and 76). Occasionally it is of advantage to curette the uterus for diagnostic purposes, in bleeding of obscure origin. It has no place in the treatment of sterility, cervical infections, or puerperal sepsis (if the uterine cavity is empty). The symptoms of the first mentioned conditions are bleedings, generally of the form of menorrhagia, and, in the case of polyps, not infrequently of the form of metrorrhagia. Associated with this condition of retention of decidua or placental elements, or with the condition

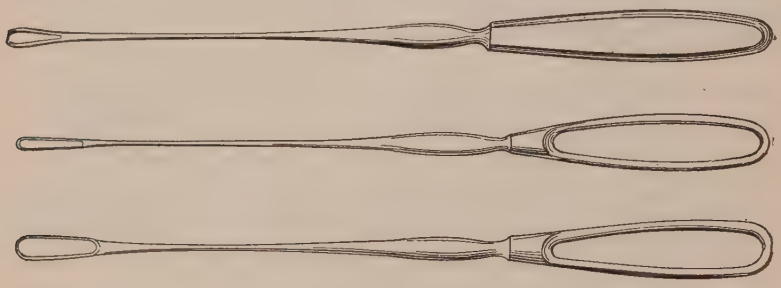


Fig. 75.—Three sharp curets.

of "hyperplastic endometritis," is an involvement of the uterine wall. As can be seen from the etiology, the uterus is often large, sometimes soft, sometimes hard; it is congested and subinvoluted. Its contractility is altered, and a state of atony often exists. Hence the condition of the uterine wall plays an important part in the production of menorrhagia. Curettage not only removes the abnormal endometrium, but by its physical stimulus and by the loss of blood rouses the uterus to contraction. A curettage, followed as it should be by a hot intrauterine lysol or iodine irrigation, with a double-running irrigator, produces, as can be determined by measuring the uterus with a sound, further marked diminution in the size of the uterus. The subsequent introduction into the uterine cavity of a wick of iodoform gauze, plus an intramuscular injection of five minims of pituitrin, and the administration of ergotol for several days, brings about further involution of the

uterine wall. In those cases in which the uterus is quite large and flabby, especially if the cavity of the uterus is large, and the walls thin and atonic, atmocausis, carried out for half a minute to a minute after the curetting, has a splendid action in contracting the uterus, and in promoting a serous exudation which greatly aids the subsequent involution.

Curettage for hyperplastic endometrium is followed, in the hands of many men, by routine applications to the uterine cavity although personally we do not advocate this practice. Perchlorid of iron, carbolic acid, tincture of iodin, tincture of iodin and carbolic acid, chromic acid 5 to 10 per cent., chlorid of zinc 5 to 10 per cent., 50 per cent. carbolic acid in alcohol, ichthyol 10 to 20 per cent. or stronger, etc., are used as more or

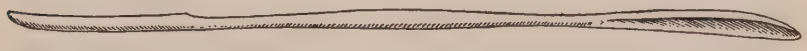


Fig. 76.—Martin's curet, which is useful in taking out the ring of adenoid tissue so often present at the internal os.

less routine procedures. Unless a curetting is too energetically done, or unless the subsequent applications exert too deep a caustic action and thereby cause atrophy of the uterus or obliteration of the uterine cavity, the majority of cases of hyperplastic endometrium treated by this method are much improved or cured, so long as a hyperplastic endometrium is really present.

Frequently, where this condition is diagnosed, there is no hypertrophic endometrium. The uterus is soft and flabby, the walls are atonic, and curetting is of no value. Such cases need occasional intramuscular injections of pituitrin, the internal administration of ergot, the use of bimanual massage of the uterus, and douches which increase the uterine tone. Hot vaginal douches are of importance in promoting contraction of the uterus. Frequently, where a hyperplastic condition is diagnosed, the curet scrapes away very little mucosa, the uterus is hard, the curet transmits the impression of hard fibrotic walls. We are here dealing with alterations of a permanent nature, involving the uterine muscle, its connective tissue and vessels. These are the cases in which atmocausis carried out for a period

of two to five minutes sometimes causes marked improvement, but ofttimes only a temporary one, so that hysterectomy is occasionally necessary.

In the treatment of true inflammatory endometritis, of the chronic form, there is great difference of opinion as to the use of the curet. Some advise against its use, while others report excellent results. Although periuterine or adnexal involvements constitute a contraindication, yet the curet is used by some even in cases complicated by old inflammatory involvements about the uterus. In the case of gonorrhea of the uterus only, Boldt and many others advise curettage followed by intrauterine applications or by intrauterine packings soaked in germicidal solutions, usually the silver salts. It must be remembered that gonorrhea involving the uterus is a disease the extent of which cannot be accurately gaged. In many cases the condition is a superficial one, as Bumm believes it to be in the vast majority of instances. The reaction of individuals to the inroads of the gonococcus is extremely variable. In some the disease progresses rapidly and produces deep subepithelial involvement, the activity of the process continuing for months and years. In others the invasion is not extensive nor is the involvement deep, and these patients seem relatively immune, in the sense that they more or less readily overcome the infection and the gonococci disappear. In considering the treatment of intrauterine gonorrhea, we may divide the cases into three classes: (1) That form associated with pyosalpinx; (2) a form associated with mild salpingo-oöphoritis, of which sterility is often the only symptom. (3) The third class is that in which neither subjectively nor objectively can involvement of the adnexa be determined. It is difficult to see the value of curettage in the first class of cases, and the dangers associated with the use of the curet in the presence of pyosalpinx are not to be underestimated. In the second class, where marked peritoneal involvement is often absent, the danger of lighting up a recrudescence is certainly great. In the third class, where we presuppose no disease of the tubes, ovaries, or peritoneum, why take the chance of producing such a disease, with the resulting consequences of sterility and pain? In those cases in which the

condition is limited to the uterus, and is superficial, there is a relative immunity on the part of the patient, and conservative treatment aids the natural resistance of the patient in ridding the mucosa of the superficial changes. At best this condition is no bar to pregnancy, for this takes place in many cases. Care and conservative treatment have not infrequently resulted in pregnancy even when a gonorrhea has involved the tubes, ovaries, and peritoneum. There are cases of intrauterine gonorrhea in which no intrauterine therapy will rid this organ of its specific diplococci. The experience of Bumm shows that even his method not rarely results in a disappearance of the gonococci, only to be followed subsequently by their reappearance. The annoyances which patients suffer as a result of localized intrauterine gonorrhea are not sufficient of themselves to justify the use of the curet, and if associated lesions of the tube, ovary, and peritoneum are the factors which bring the patient to us for help, in my opinion curettage is certainly not indicated then.

In the treatment of uterine conditions of uncertain etiology associated with pathologic discharge, we must recognize some as due to gonococci, but without the microscopic evidences of their presence; we may consider some of them as originally gonorrheal, and eventually chronic, as a result of structural changes and the presence perhaps of other bacteria and cocci. Some we may consider as originally due to bacteria other than the gonococci. This is an all-important question. Either there once existed a mild or severe inflammatory endometritis after abortion or labor, which persists in subacute chronic form, or else there has occurred, in a uterus congested and hyperemic, an invasion of non-specific bacteria which produce and keep up a more or less constant intrauterine discharge. It is often impossible to distinguish such cases from the forms of hypersecretion existing in uteri subjected to the alterations of subinvolution and the hypersecretion associated with chlorosis and anemia, or associated with the congested uteri of fat women, many of whom are multiparæ. Microscopic examination of smears, however, often aids materially in differentiating these conditions. If we find that pus corpuscles predominate and

pyogenic organisms are present, chronic inflammation is recognized. But if mucus corpuscles and mucus threads predominate, and no pathogenic microorganisms other than the micrococcus catarrhalis are present, the leucorrhœa may be considered but a manifestation of hypersecretion.

In these various forms the curet in the hands of many is used because of the uterine leukorrhea, and often, as reports go, with very satisfactory results. By others intrauterine applications without curettage are applied: chromic acid, 5 per cent.; perchlorid of iron, 5 per cent.; sulphate of zinc, 5 to 10 per cent.; chlorid of zinc, 5 to 10 per cent.; carbolic acid and alcohol, equal parts; ichthyol, 10 to 20 per cent.; tincture of iodin, 50 per cent.; nitrate of silver, 5 per cent., etc. We never use the curet for uterine leukorrhea alone.

It is in this class of cases, if the annoyances justify its use, that intrauterine irrigations are applicable. A watery solution of iodine (1 dram of the tincture in 1 quart of water) is particularly efficacious. The solutions used with the aid of the double-running irrigator are numerous.

In this class of cases the safest and most conservative treatment is the use of prolonged cold water vaginal douches.

Much is considered, however, under endometritis which has nothing to do with inflammation of the endometrium.

Leukorrhea in anemic and chlorotic girls is primarily due to anemia of the mucosa, and to subsequent serous transudation on the part of the hydremic blood. On this basis, of course, there occurs more readily an inflammatory endometritis.

Isolated inflammation of the cervix mucosa is to be treated by drugs. Vaginal douches are of value, when cool, in the acute stage, and hot in the chronic stage. Mud baths and carbonated saline baths are important. When the portio is hyperemic, in addition to the bath treatment Glauber's salts are of value. If hyperemia persists, we use cool douches of 70° to 55°. Scarification followed by suction can be carried out. The treatment of erosions is by medicaments.

Curettage.—In the performance of curettage all the aseptic precautions of a major operation should be observed. The vulva should be shaved and thoroughly disinfected, and the

vagina should be scrubbed with green soap with the aid of a gauze sponge on a sponge-holder, followed by a thorough flushing with 0.5 to 1 per cent. lysol solution.

The patient is in the lithotomy position on a Kelly pad. The entire vulvar area is covered with a sterile sheet, with the exception of an opening large enough to permit of the required

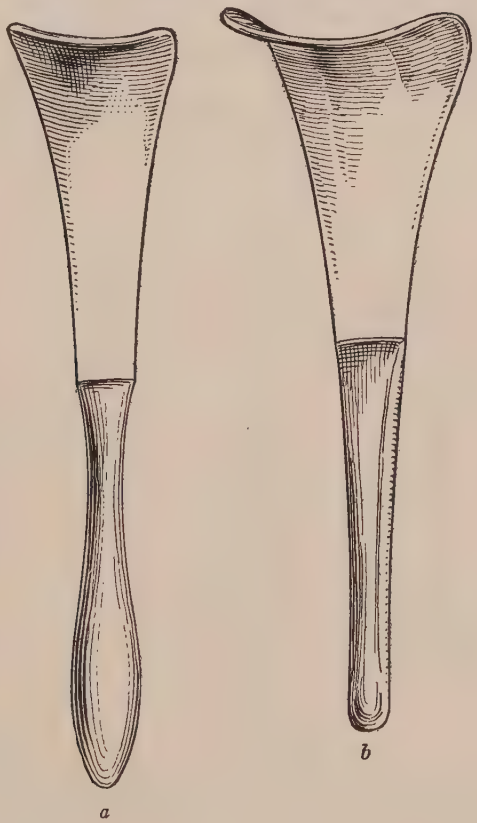


Fig. 77.—*a*, Anterior vaginal retractor; *b*, posterior vaginal retractor.

manipulations. A towel or the lower margin of the perforation in the sheet should be fastened by a towel clamp to the perineum so that the anus is entirely out of the field. A Garrigues weighted speculum, which is self-retaining, or an Edebohls speculum to which is attached a small pail to catch the fluids, and which is likewise self-retaining, may be used.

With proper assistance, however, a broad flat speculum is better, and should be held in place by an assistant. An anterior speculum is introduced so that the cervix is brought into view, and the anterior lip of the cervix is then grasped firmly with a volsella. The cervix is dried and a sound is introduced to measure the length and position of the uterus.

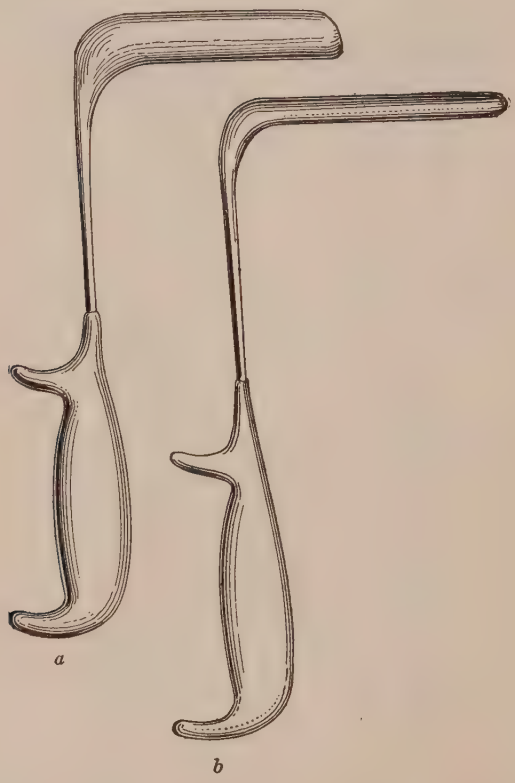


Fig. 78.—*a*, Wide vaginal speculum; *b*, narrow vaginal speculum and retractor.

The cervix must then be thoroughly dilated. This may be done with the glove-stretcher dilator, or, better still, with Hegar graduated dilators, which are dipped into a lysol solution or into sterile lubricant. With the latter dilators, if time is taken, a very thorough dilatation of the cervix is obtained without breaking the tissues, and the danger of tearing through the cervix into one or the other of the broad ligaments is obviated.

This danger is always present when using a glove-stretcher dilator hastily with a rigid cervix.

Figs. 77 to 80 show flat vaginal specula, of various lengths and breadths, to be used as anterior and posterior retractors in manipulations or operations on the cervix and uterus. They are of great aid in performing vaginal celiotomy.

Fig. 79.—Simon's posterior vaginal speculum.

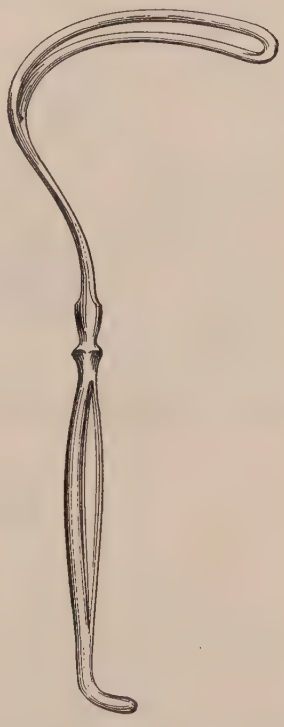


Fig. 80.—Anterior vaginal retractor.

After thorough dilatation of the cervix a small sized curet is taken and the index-finger of the right hand is placed at a distance from the tip which corresponds to the length of the uterus as measured by the sound. If the finger be held at this point during the performance of curettage, the danger of perforating the uterus is greatly lessened (Fig. 82). The inner surface of the uterus is then curetted by gentle but firm move-

ments from above downward, passing around the entire interior of the uterus successively. This manipulation is repeated two or three times, particular attention being paid to the lateral borders of the uterine cavity and to the region of the uterine cornua.

When the curet has removed the superfluous tissues and sufficient of the endometrium, its contact with the uterine wall causes a feeling of resistance and produces a hard, gristly

Fig. 81.—Half section, Fritsch intrauterine double-running irrigator in place. So long as the opening on the under surface is outside of the cervix no great intrauterine pressure by fluid can be exerted.

grating. The uterus may then be irrigated with a double-running irrigator, 0.5 to 1 per cent. lysol solution being used. But if the curettage has been properly and thoroughly done, the latter step is unnecessary.

A smaller curet is again introduced and the surface is gone over again gently and the uterus once more irrigated; a twisted wick of iodoform gauze may be introduced into the uterus by the intrauterine packer and withdrawn so that the uterus is freed of the retained fluid or blood. A fresh twisted strip of iodoform gauze is then packed into the uterus, including the

cervix, and an end long enough to reach beyond the introitus is held outside the vulva (Fig. 83). The volsella which grasps the cervix is taken off and a wide strip of iodoform gauze is then packed thoroughly into the fornices and in the vagina, passing in circular fashion about this intrauterine strip. The speculum is then removed and a knot is tied in the intrauterine

Fig. 82.—Half section of the pelvis, showing posterior retractor and volsella in place with the curet in the uterus and the finger held on the curet to avoid danger of perforation. In curettage the index-finger of the right hand, when placed at a measured point on the curet, and held there during the curetting, avoids the danger of entering so deeply with this instrument as to perforate a uterus. The length of the uterine canal is first measured with a sound, gently introduced, and the finger is placed on the curet at the corresponding point.

strip so that it may be recognized and removed after twenty-four, forty-eight, or seventy-two hours without disturbing the vaginal packing. Before the patient is returned to bed an intramuscular injection of five minims of pituitrin is given.

So soon as possible ergot, or ergotol (15 minims), is administered for several days, even after the removal of the intrauterine strip.

The vaginal packing is removed after three or four days, and short hot vaginal douches containing lysol 0.5 per cent., or carbolic acid 1 per cent., or iodin, 1 dram of the tincture to 2 quarts of water, are given.

The operation of simple curettage can be very well performed with the aid of nitrous oxid anesthesia and it should never be

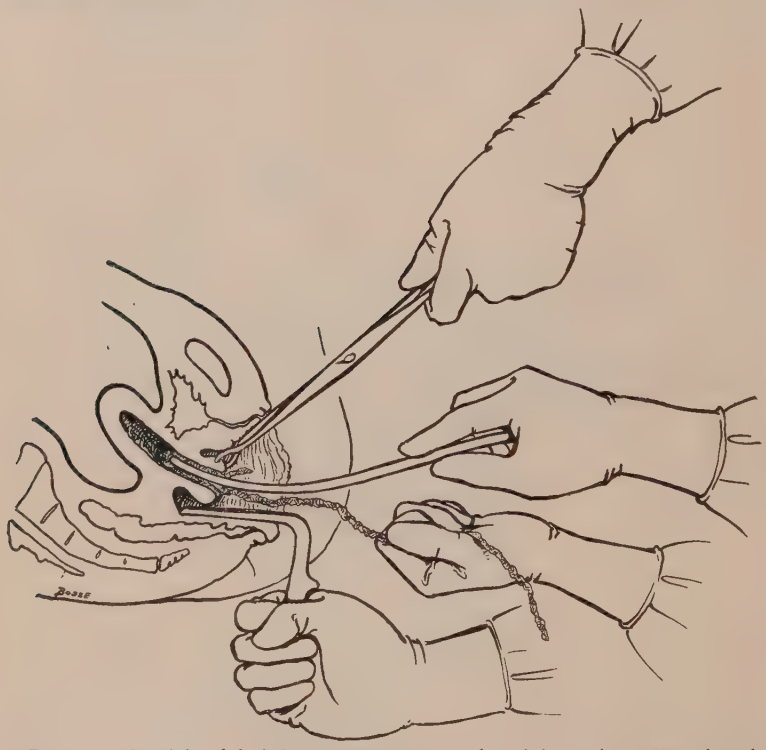


Fig. 83.—A wick of iodoform gauze is introduced into the uterus by the dressing forceps or, better still, by a packer which is of the caliber of a sound and which has a serrated tip so that the end of the gauze, when placed on it, does not slip off.

attempted without general anesthesia. If curettage is done for incomplete abortion in the very early weeks, this method suffices, very great care being necessary to use a medium-sized curet with the gentlest of manipulations. The size of the uterus must be determined by bimanual examination and by the use of the sound.

In progressing abortion in the third or fourth months with the retention of the ovum, if the cervix is very well dilated the uterine contents may often be removed by the careful use of the placental forceps (Fig. 84). If the cervix is not well dilated, it may be stretched either by the glove-stretcher dilator, or, better still, by the use of the Hegar dilators. On the other hand, it is wise, unless the surroundings and conditions prevent,

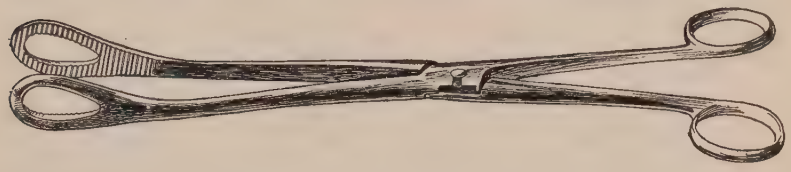


Fig. 84.—Placental forceps, to be introduced into the uterus to grasp an ovum, or fetal sac or retained products of conception which are lying in the uterine cavity. If it is desired to remove placental tissue in contact with the uterine wall, the location of this tissue should be first determined by introducing the middle finger into the uterus. One blade of the placental forceps serves well as a dull curet.

to dilate the cervix in most of these cases by packing the uterus, and especially the cervix, under strictest aseptic precautions, with iodoform gauze, and then packing the fornices and vagina to the introitus vaginæ with a wide strip of iodoform gauze. This method of painless dilatation of the cervix has the advantage that no injury is done to the friable cervical tissues.

Fig. 85.—Dull curet, for removing placental tissue in contact with the uterine wall and for removing decidual tissue by very gentle curettage.

It frequently happens that the retained ovum is found readily by the placental forceps after this method of dilatation, especially if during the time in which the gauze has been in place (twenty-four to forty-eight hours) ergot or ergotol is administered. The administration of ergot causes contraction of the uterus, and, the exit of blood being prevented by the gauze, the ovum is loosened from contact with the uterine wall. After removing the gauze the placental forceps may grasp the ovum and remove it *in toto*, even without the use of anesthesia. Careful curettage with a blunt curet (Fig. 85) completes the

operation and is followed by an intrauterine irrigation with very hot lysol (0.5 per cent.); temperature, 115° F. If the uterus does not contract well, 4 ounces of dilute acetic acid to the quart of hot water is used as an intrauterine irrigation. The uterus and vagina are then packed with iodoform gauze.

Curage in Abortion in Third and Fourth Months.—If the placental forceps do not grasp a loosened ovum, the middle

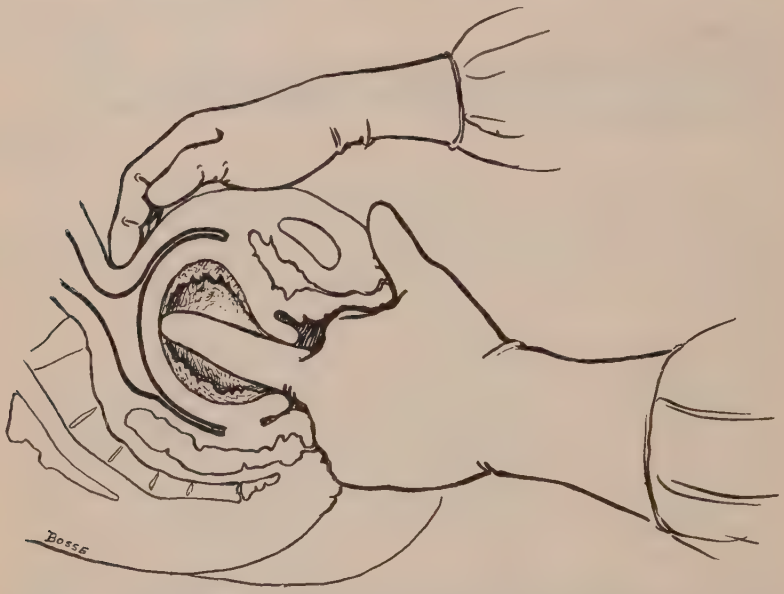


Fig. 86.—Half section, showing the introduction of the middle finger into the uterus and the pressing down of the fundus uteri by the external fingers. By this combined manipulation an ovum can be completely loosened from connection with the uterine wall and adherent placental tissue can be scraped off. This method known as "curage," is a sure, safe procedure and obviates the danger of perforation or of leaving behind unrecognized fetal products. The cervix must be well dilated.

finger, under the strictest aseptic precautions, is introduced into the cervix and uterus; the other hand, pressing through the abdominal wall, pushes the uterus down into the pelvis, and pressing on the fundus brings it in contact with the internal finger. In this way the middle finger of the internal hand can palpate the entire uterine cavity, can separate the whole ovum or the adherent parts, or remove whatever of fetal sac or placenta is attached (Fig. 86). After this procedure the placen-

tal forceps carefully introduced can extract whatever loosened contents are in the uterus. The uterus should then receive a very hot douche, with a double-running irrigator, of 1 per cent. lysol. If the finger has been unable to separate part of the placental tissues, their location at least is noted, and placental forceps or a large blunt curet are then introduced for their removal. The uterus is then packed with iodoform gauze, and pituitrin and ergot are administered. The vagina is also packed with iodoform gauze. The gauze is removed in from twenty-four to forty-eight hours and the ergot is continued. In incomplete abortion it is rarely necessary to use the sharp curet unless, in very early cases, the uterus is so small that the finger method, or curage, cannot be used. The use of the sharp curet alone is dangerous in abortion in the third and fourth months: first, we are never sure that we have removed all the products of conception; second, the uterus is easily perforated. During the manipulation of the curet the uterus dilates and contracts as it does in the post-partum period at full term, and if the curet is held very firmly, simple contraction of the uterus is enough to cause perforation by this instrument, even if dull.

It is by no means infrequent to find after abortions at the tenth or twelfth week, when an embryo is spontaneously expelled, that decidua, the sac of the ovum, or placental remnants are retained. These, as a rule, prevent the uterus from returning to normal size; the cervix does not contract, and there is generally a steady or irregular loss of blood. Under these circumstances the method of slow dilatation of the cervix by packing it and the vagina with iodoform gauze for twenty-four hours, and of examination and cleansing of cavity with the finger, is advisable. If this procedure is not possible, or if the finger finds no retained fetal tissues, the dull curet should be used with great caution. In using any curet in the uterus, it is customary first to measure the length of the uterine cavity with a sound and then to place the index-finger of the right hand on the curet at a point which makes the distance from the tip of the curet to the finger a little less than the length of the uterine canal, as measured by the sound. Curettage is then

done, with the finger held firmly on this point, so that the instrument at no time enters further into the uterus than the measured length. The previously described method of painless, slow dilatation of the cervix by the use of iodoform gauze is the safest and wisest procedure. The above method of removing the contents of the uterus by the introduced finger is surest and safest. The finger recognizes adherent tissues. It locates any tissue that cannot be scraped off; it is unlikely to perforate the uterus. It makes the diagnosis and carries out the treatment. It should be used in every case in which the uterus is three times the normal size.

Atmocausis.—Snegirjeff, in Moscow, has for years used steam at a temperature of 100° C. in controlling uterine bleedings. In his opinion, steam cauterizes, stops hemorrhage, deodorizes every odor, and diminishes the sensitiveness of the inner lining of the uterus. This method has been used more or less extensively by European gynecologists for a variety of gynecologic affections, but has never become popular in this country.

Kahn used this procedure in many cases of septic postpartum endometritis. He found that the sensitiveness of the uterus is diminished and that good contractions follow. The steam has a bactericidal effect and the disagreeable odor disappears. Through thrombosis, the blood-vessels and lymph-vessels are closed and a protecting cover is formed for the development of fresh granulations. Clinically, temperature falls, usually by crisis. Only in those cases where action is delayed, or where placenta or membranes are retained, is there a failure of immediate improvement. In the clinic of Pawlik, in Prague, about fifty cases were first treated by this method, and with excellent results, especially cases of abortion with profuse bleedings due to atonic uteri, and chronic hemorrhagic endometritis.

The improvements which Dührssen made in the apparatus used for this purpose are undoubtedly responsible, in a great measure, for the good results. Originally, Pincus used metallic catheters for the intrauterine introduction of steam. Later he added a tube which permitted the outflow of the condensed

steam. Since the metal tubes caused deep cauterization and stenosis of the cervix, through direct contact of the hot catheter, he used gauze to protect this part of the uterus. Later he used tubular wooden plates to protect the lining of the cervix from cauterization.

Unfavorable results have been reported, among others by Czempin, who mentioned an atrophia uteri with climacterium præcox in a patient who, six and one-half months post partum,

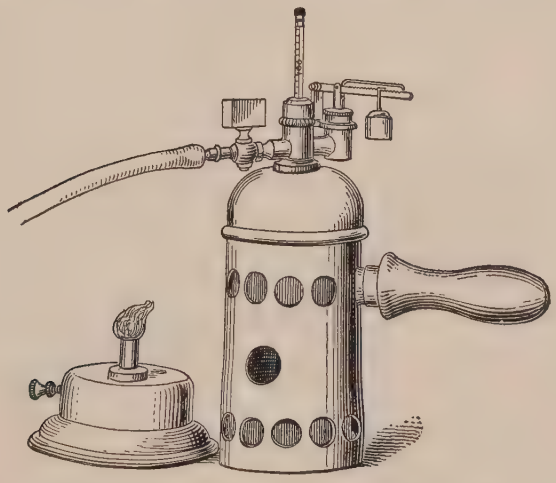


Fig. 87.—Atmocausis boiler for the production of steam which is to be introduced into the uterus for periods varying from thirty seconds to seven minutes (atmocausis). The cervix must first be well dilated and the uterine lining must be free of fetal products or of new-growths.

was treated by this method for a hemorrhage lasting eight weeks. A death was reported from the clinic of Traube, due to necrosis and perforation of the uterus resulting in peritonitis. Von Weiss recorded an obliteratio uteri in a non-puerperal case treated for continued uterine bleeding.

These failures and poor results occurred for the following reasons:

1. The introduced catheter permitted no outlet for the vapor, so that a continued action of the same resulted.

2. The heated metal catheter caused a deep cauterization, through direct contact with the cervix and uterus.

3. On contraction of the uterus the tip of the metal catheter exerted a local and deeply cauterizing action.

The advantages of the apparatus of Dührssen (Figs. 87 and 88) are as follows:

1. The uterine tube consists of fiber which does not transmit heat, so that the cervix is protected.

2. This tube is centrally perforated and its lumen is so large that when the metal tube through which the steam enters the uterus is introduced there is sufficient room for an outflow of steam and coagulated blood (Fig. 88).

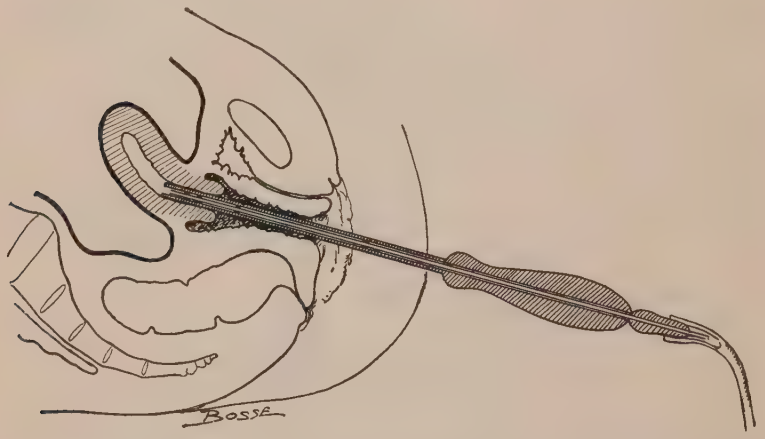


Fig. 88.—Section showing atmocausis tubes in place. The space between the inner and outer tubes is to be noted. Little knobs on the inner tube carry the altered blood down and out as this inner tube is drawn out slightly at regular intervals.

3. This metal tube, through which the steam passes, does not come in contact at any point with the mucous lining of the uterus.

This method has been used mostly for bleedings which could not be overcome by other methods. Radium, however, has now supplanted it to a large extent.

The duration of the application of steam is, as a rule, thirty to forty seconds in younger women, where no obliteration is desired; five to eight minutes if total obliteration is intended. The temperature used is 100° C. in the boiler of the instrument,

which temperature is there registered by a thermometer. The boiler of the instrument is protected by a safety-valve, which eliminates all danger, and the outlet tube is controlled by a stop-cock for two purposes: first, it may be desired to use steam of a higher temperature, which can readily be obtained if the stop-cock is closed; second, before introducing the metal catheter conveying the steam into the uterine tubes, the stop-cock is opened to see if the steam appearsand to remove water from the metal catheter. The stop-cock is then closed for a second or two until the catheter is introduced into the uterine tube. At any time, if desired, the supply of steam may thereby be shut off. (See Fig. 87.)

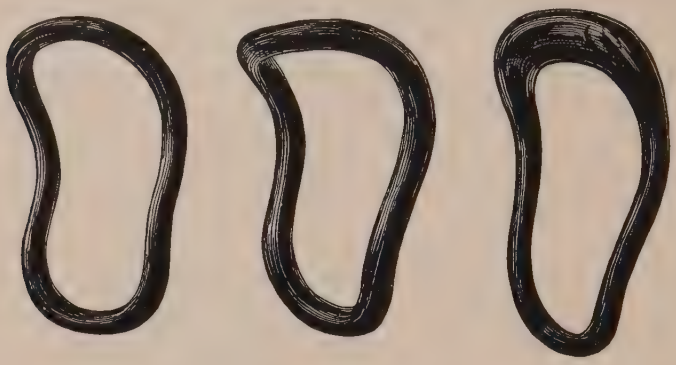
There is generally a serous discharge for days or weeks after this treatment. The action upon the uterus and its lining may be judged by the character of the necrotic tissue which is thrown off in bits or as a whole. This necrotic tissue makes its appearance in from six to ten days if the action has been superficial, and in ten or more days if a deeper cauterization has resulted. If this method is to be repeated, it should be done only after a lapse of four weeks, when the mucous lining has been regenerated. Not infrequently, after this treatment, irregular bleedings or one or two increased menstrual bleedings may occur. The former are the result of the throwing off of necrotic tissue; the latter gradually go over into natural menstruation. The contraindications to the use of this method are malignant changes of the endometrium and the presence of retained placenta or membranes. Other contraindications are those affections of the tubes and those inflammatory conditions which are generally recognized as contraindications to curettage.

PESSARIES

A Smith or Hodge or Thomas pessary (Fig. 89) often meets the indications for the correction of retroversion, retroflexion, and retrodisplacement and for the support of hysteroptosis.

The shape of each pessary, as to its length and the degree of its curve, should be adapted and fitted to the contour and size of the vagina. Rubber rings of different sizes may be put in boiling water and then bent into proper form for those cases in

which the ready-made pessary does not meet the indications (Fig. 90). In fitting a pessary of one of the above types its length should correspond to the distance from the symphysis to the posterior vaginal fornix as measured by the fingers when



a *b* *c*

Fig. 89.—*a*, Hodge pessary; *b*, Smith pessary; *c*, Thomas pessary.

the uterus has been replaced and the cervix has been pushed far back and high up. The width of the pessary at its posterior end must be sufficient to fill out the posterior fornix; the upward curve of the posterior bar should be high enough to bring the

a *b* *d*

Fig. 90.—*a*, Ring to be placed in boiling water and made into any form of pessary, as *b*, *c*, *d*.

posterior end high up back of the cervix. The anterior end must not be too wide; just wide enough to fit behind the symphysis, and to be supported and kept in place by the symphysis. The anterior bar should be curved enough so that

the tip does not press against the urethra. The anterior bar may be indented so as to form an arch over the urethra.

Before introducing one of these pessaries, the bladder and rectum should be empty, and the uterus must be freely movable, and replaced in its proper position. Never insert the pessary before restoring the uterus to its normal position by manipulation.

It frequently requires patience to get the right form and size for some cases. A wise rule is that of always using a small

Fig. 91.—Drawing showing various positions of the uterus, anteflexion, retroversion, retroflexion, with the changed position of the cervix, which has moved down and forward in the two latter.

size first, rather than taking the chance of introducing a pessary which is too large.

The pessary is supposed to be held by the levator ani muscles and by the elastic pressure of the vaginal wall. It must not be permitted to press on any bony prominence. It should cause no pain or discomfort.

When in place the pessary acts by stretching the posterior fornix, by keeping it high up and far back, and so carrying the cervix with it. When it fits properly, a pessary causes no pain or annoyance. Adhesions about the uterus or inflammation of the adnexa are contraindications to the use of the pessary.

In long-standing retroflexions or in retrodisplacements where the uterosacral ligaments are firm and contracted, preliminary treatment in the form of massage or intravaginal pressure therapy may be necessary to enable us to lift the cervix upward and backward so that the fundus will naturally fall forward. In other cases treatment by glycerin and gauze is often advisable to permit of a return of the subinvoluted, stretched ligaments of the uterus to their normal elasticity. In those cases where replacement is difficult in spite of the absence of adhesions, gauze soaked in glycerin, packed thor-

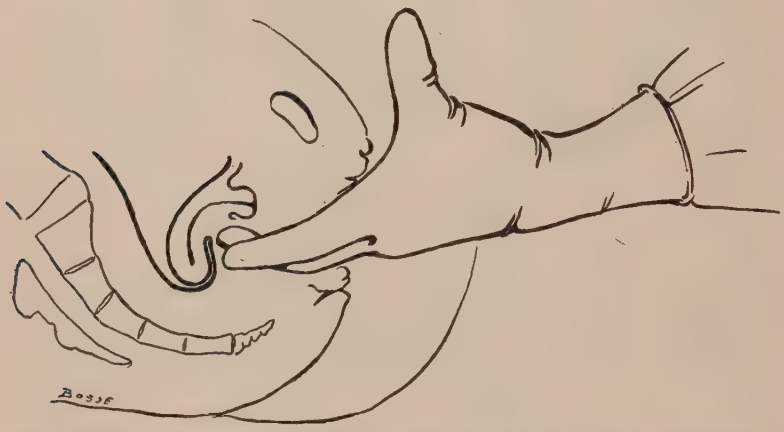


Fig. 92.—First step in the correction of mobile retroflexion. The internal fingers are introduced under and back of the cervix to lift it up.

oughly into the posterior fornix while the cervix is pulled down by a volsellum, is made use of on several alternate days, and will facilitate the subsequent reposition of the uterus.

Replacing the Uterus.—Without the aid of the external hand, the internal fingers should be passed deeply into the posterior fornix and underneath the cervix, and the fundus and cervix lifted up toward the abdominal wall (Fig. 92). This puts the uterosacral ligaments and the posterior parametrium on the stretch. If then the middle finger be passed from right to left in the posterior fornix, thickened uterosacral ligaments can be identified and any peritoneal adhesions on the posterior wall of the uterus can be felt. At the same time the mobility of the uterus is defined, and pain will be produced in the back and

in the rectum in pathologic involvements of the posterior parametrium. There will be greater pain with peritoneal

Fig. 93.—Second step in the correction of mobile retroflexion. The internal fingers pass high up into the posterior fornix and push the fundus of the uterus upward. If the fundus can be carried as high as pictured here, the external finger may pass behind it. This is rarely possible.

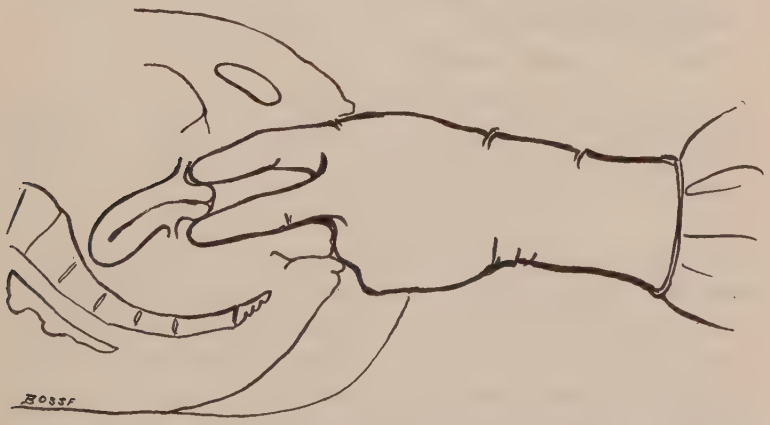


Fig. 94.—Third step in the correction of retroflexion. The index-finger in the anterior fornix is to push the cervix downward, backward, and upward, and thus influence the fundus to move upward.

adhesions. The fundus should then be pushed upward (Fig. 93). After performing this manipulation the index-finger is

placed in the anterior fornix and the middle finger high up in the posterior fornix (Fig. 94). The index-finger then pushes the cervix down and backward, which manipulation, when repeated several times with increasing firmness, always preceded by the lifting of the cervix, will bring a movable fundus further forward, away from the sacral promontory (Fig. 95), especially if the internal fingers at the beginning pushed the

Fig. 95.—Fourth step in the correction of retroflexion. The index-finger in the anterior fornix has pushed the cervix down, back, and upward. This step, repeated several times with increasing force, has caught the fundus at the correct elevation and it moves upward and forward. The firmer the area at the internal os. the more readily is this manipulation carried on.

fundus upward (Fig. 93). If then (Fig. 95) the external hand be pressed down through the abdominal wall toward the hollow of the sacrum, behind the point to which the fundus is brought by this manipulation, and if then these fingers pull or massage the fundus toward the symphysis (Fig. 96), almost every movable retroverted or retroflexed uterus can be brought temporarily into normal anteversion or anteflexion. If the external fingers be passed behind the uterus and the uterus cannot be brought forward or can be brought forward only with pain, we may presume the existence of peritoneal adhesions to

the uterus, or fixation of the tubes and ovaries with shortening of the ligamenta infundibulopelvica, or else we feel the retracted and thickened uterosacral ligaments. In such instances the two fingers of the internal hand being passed high up into the posterior fornix can make out the peritoneal adhesions, and if passed into the lateral fornices can make out the lateral or deep fixation of the tubes and ovaries.

Fig. 96.—Final step in the correction of retroflexion. When the uterus has been manipulated as in Fig. 95 then the external fingers pressing deeply through the abdominal wall find themselves back of the fundus. They press the fundus forward, after the internal fingers, in front of and under the cervix, have lifted the uterus upward. The uterus is thus brought into the normal position. If now it be desired to introduce a pessary, the internal fingers must keep the cervix high up and far back. On the palmar surface of these internal fingers the pessary is introduced.

Introducing the Pessary.—Before introducing the pessary the uterus must be replaced and the cervix pushed back and up with the fingers of the internal hand. The pessary should be well lubricated. It is then introduced over the palmar surface of the fingers which are in the vagina (Fig. 97). It is inserted in a position midway between the transverse and longitudinal diameters of the vagina, the posterior bar passing

into the anterior fornix. The internal fingers then pass through the posterior curve and back over the broad bar of the pessary, and the fingers are turned so that the palmar surface looks down. This manipulation by the fingers gradually carries the pessary into the transverse position and also guides it backward toward the posterior fornix (Fig. 99). The anterior end is held by the index-finger of the other hand so that it does not press against the urethra and the symphysis, and then the posterior end is depressed under the cervix so that it slips up behind it. The anterior end should disappear behind the symphysis (Fig. 100). The patient is told to press or bear down as if at stool, and if the pessary is properly fitted it will remain in place and the anterior end will be only slightly visible. If too long, a shorter pessary should be used. If the anterior end is too wide, a narrower one should be selected. The pessary is of especial value in post-partum treatment to prevent the development of an acquired retroversion or retroflexion. In long-standing instances, where operation is refused, it may be worn for years if the patient takes douches daily, and if the pessary is removed, cleansed, and replaced at least once a month. In some of these cases it may effect a cure of a long existing retrodeviation, but this result is uncertain and occurs only in a small percentage of cases (10 to 15 per cent.). The supporting ligaments of the uterus are so attenuated that they are incapable of regaining their normal tonicity.

In displacements, in descent, and in prolapse the pessary fits between the uterus and the levator ani. The pessary stretches the posterior fornix and pushes the cervix high up and backward. Its power to hold the uterus depends upon the condition of the levator ani muscles and the elasticity of the vagina. If the vaginal elasticity is gone and the levator ani muscles are too lax, the pessary will not remain in place.

In some cases of cystocele, with the uterus in normal position a small pessary may be introduced so that the narrow anterior end does not come within an inch of the symphysis. The pessary is held in place by its posterior bar in the posterior fornix behind the cervix. The anterior end lies along the anterior end of the vagina and lifts up and supports the cystocele.

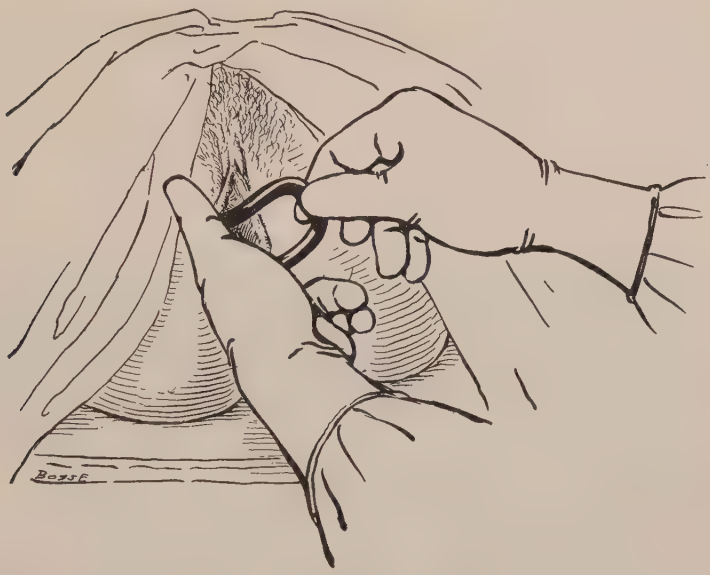


Fig. 97.—The first step in introducing the pessary. The uterus has been brought into anteflexion. The internal fingers keep the cervix high up and back, the palmar surfaces of the two first fingers are turned so that they look almost upward, the pessary is held so that its edge does not touch the urethral canal. The pessary is passed into the vagina on the palmar surfaces of the internal fingers. The two last fingers of the left hand are flexed upon the palm.

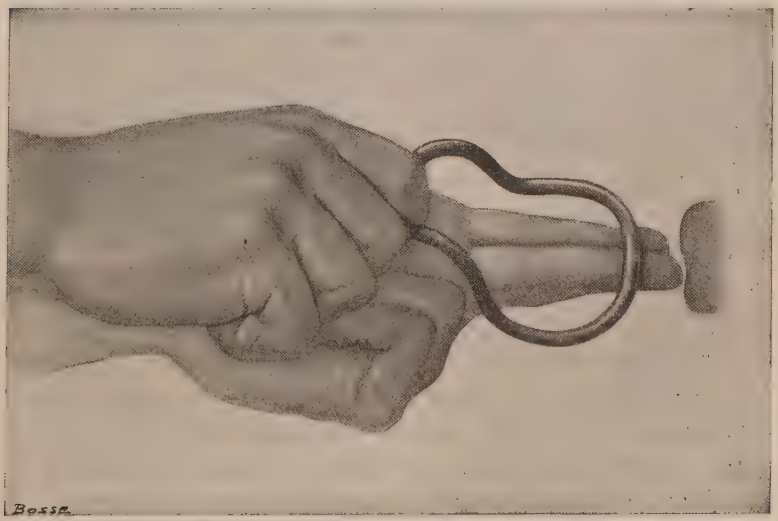


Fig. 98.—Second step in introducing a pessary. After the pessary has been introduced so that its upper bar is in the anterior fornix the two internal fingers pass up over this bar and are turned so that the palmar surfaces look downward.

Skene's pessary is sometimes of value in supporting a cystocele if the uterus is normally placed. The upper end of the pessary is fixed behind the cervix. The anterior end is a broad bar of a very high curve, supported by a wedge underneath it. The posterior bar fits back of the cervix and the high anterior end fits behind the symphysis and lifts up and supports the hernia of the bladder (Fig. 101). Gehrung's pessary has

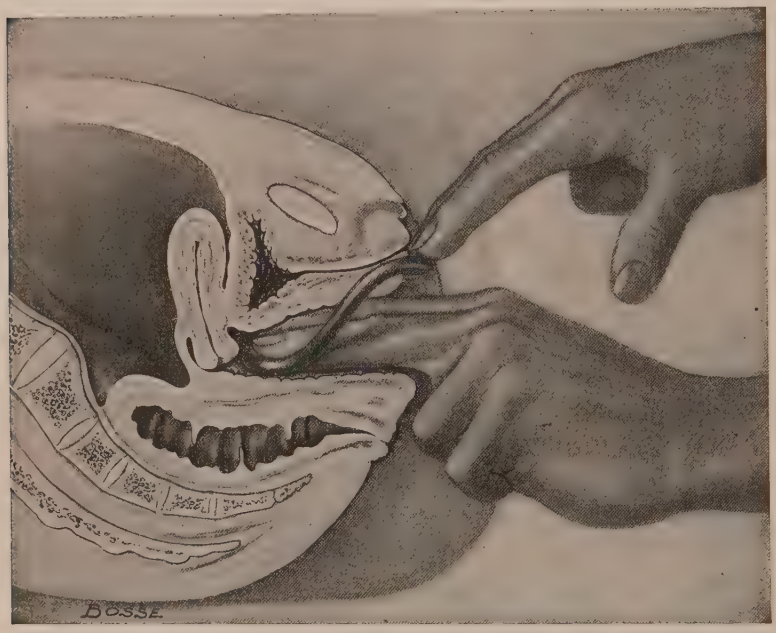


Fig. 99.—Third step in introducing the pessary. The tips of the internal fingers over the posterior bar push this bar down under the tip of the cervix and carry it up into the posterior fornix. The anterior bar is held by the tip of the index-finger of the right hand so that it does not press against the urethra as it slips into the vagina.

been used for the same purpose, but has proved efficient in comparatively few instances.

Round, hard-rubber pessaries are used for marked descent and prolapse of the uterus and vagina (Fig. 102). In using the round ring pessaries a good perineum and fair levator ani muscles are necessary to their retention. They are introduced over the palmar surface of two fingers passed into the vagina. The ring is introduced into the vagina in a diameter midway

between the transverse and antero-posterior diameter of the vagina. The internal fingers then manipulate the ring so as to bring its opening as closely as possible over or up to the cervix and the ring lies transversely to the axis of the vagina. If too small, the ring slips out after a few hours. If too large, it causes pain by pressure on the rectum and vaginal

Fig. 100.—Pessary in place. After the pessary is in place the patient should be told to press down as if at stool to see if the pessary is accurately fitted. There is no objection to introducing the bivalve speculum and carrying out any cervical, vaginal, or intrauterine manipulation or intravaginal packing with glycerin and gauze. The presence of the pessary does not interfere with these therapeutic procedures.

walls. The Menge pessary has a bar fitted at right angles to the ring. This bar lies in the vaginal canal and keeps the round pessary in the proper plane. An existing vaginitis, especially senile vaginitis, should be corrected before applying any pessary. Douches should be taken daily.

Inflammation of the vagina, or urethra and erosions, acute inflammation of the adnexa, are contraindications. A pessary should never excite pain, nor cause annoyance on pressing,

bending, or defecation. It is claimed that 10 to 15 per cent. of all retroflexions can be cured by the use of the pessary.

There is used for the support of a prolapsed uterus a combination of an intravaginal cup with a stem and an abdominal belt which, by the aid of strap supports, keeps the cup and stem pessary within the vagina, and so keeps the uterus within the

FIG. 101.

FIG. 102.

Fig. 101.—Skene's pessary, which is of aid in a few cases of cystocele. As a rule, however, the weight of the vaginal wall and bladder pushes this anterior end down and out of the vagina. Only when the posterior bar and lumen are held firmly by the cervix will the anterior end support a cystocele.

Fig. 102.—Round rings of hard rubber or wood, to support a descended uterus or to support a cystocele by lying transversely to the axis of the vagina and around or just below the cervix. This ring has been modified by a bar fitted at right angles to the ring which keeps the ring in its correct position. This is found in the Menge pessary.

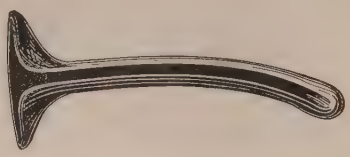


Fig. 103.—Intrauterine stem pessary, to be introduced into the cervix. This is done through a bivalve or other speculum (not a Ferguson). The pessary is held by a fine pair of dressing forceps. After the stem is introduced into the uterus, the vagina is packed with gauze for twenty-four hours to prevent the pessary being forced out of the cervix and uterus.

pelvis. This is the so-called Lavedan's cup pessary—a cumbersome and uncomfortable apparatus.

The intrauterine stem pessary may be used where there is a really marked stenosis which causes dysmenorrhea and sterility. It is perhaps more indicated in the treatment of hypoplasia and stubborn amenorrhea due to hypoplasia (Fig. 103).

The objection to the use of an intrauterine pessary is the irritation of the endometrium and of the lining of the cervix. It seems to be often used for sterility, in the belief that many of

these cases are due to stenosis of the cervix or of the external or internal os. Some of these stems are made of parallel bars of wire, so as to permit (theoretically) the upward movement of the spermatozoa. All of these implements are capable of harm in the presence of cervical, uterine, or pelvic inflammation, and the constant irritation of their presence may even excite an inflammation.

PRESSURE THERAPY FOR RESORPTION AND STRETCHING

The patient is placed in a moderate Trendelenburg position, which tends to elevate the uterus and adnexa, and permits the

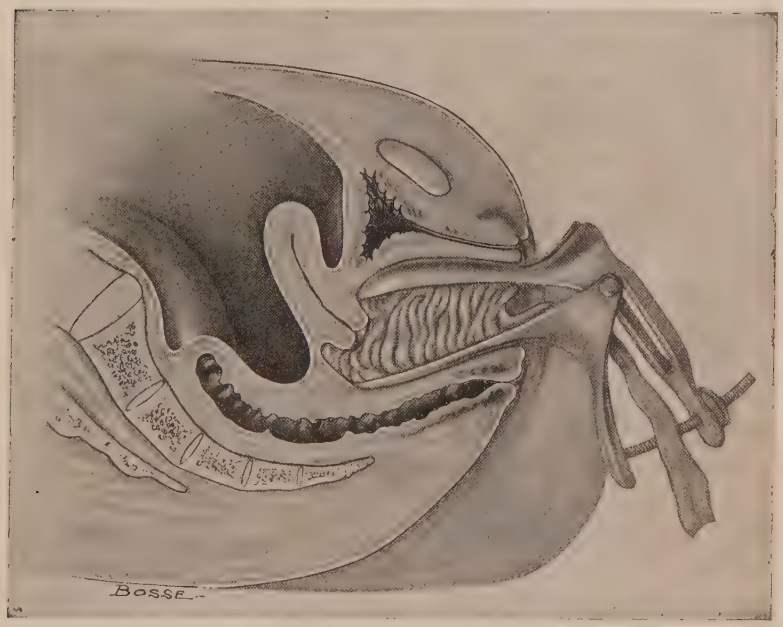


Fig. 104.—Half-section, showing the gauze in the fornices and vagina as used for the purposes of intravaginal pressure-therapy, and for other purposes in place of the routine use of cotton tampons. After the speculum is withdrawn only a slight bit of gauze is allowed to protrude into the vulva, to render removal of the gauze by the patient easy.

coils of intestine to drop out of the pelvis. A bag of sand may be placed on the abdomen to produce intrapelvic pressure. A condom or colpeurynter filled with shot or quick-silver is

introduced into the vagina. A special apparatus has been devised by Pincus and Halban for this purpose. The action of the vaginal pressure is a pull on the shortened parametrium or bands, especially if one end of the bands or adhesions is attached to the pelvic wall. Through pressure of the sand-bag on the abdomen and pressure of the bag in the fornices the uterus is elevated and exudates are compressed. During the compression between these two forces the internal genitalia are in a state of anemia, subsequently followed by reactive hyperemia. This diminishes the chronic edema of the connective tissue and increases lymphatic resorption. The same purpose can be well obtained by introducing Champetier de Ribes bags into the vagina and distending them with water. If hot water is used, the added value of the thermic effect is obtained. This treatment is suitable in the chronic stages of inflammatory diseases, never in the acute or subacute stage. Fever is a contraindication. It is mostly indicated in chronic parametritis with sclerosis of the connective tissue, especially if there is edema. It is never to be used in pyosalpinx or pus cases. This procedure is most strongly indicated, perhaps, in involvement of the uterosacral ligaments. The subsequent treatment consists in massage and bimanual stretching. A modification of this idea is well obtained by packing the fornix thoroughly with gauze with the patient in a slight Trendelenburg position, perhaps with a sand-bag on the abdomen.

We have long discontinued the use of small vaginal cotton tampons for this purpose because of the difficulty in making them remain in the desired position. We use long strips of 6-inch wide sterile gauze. The patient is placed in a mild Trendelenburg position. With the aid of a vaginal bivalve speculum the vagina is cleansed with carbolic or lysol solution and any required treatment of the cervix, uterus, or fornices is carried out. Boroglycerin to the amount of 1 or 2 ounces is then poured into the speculum. With a very long pair of dressing forceps one long strip of the sterile gauze is gently and firmly packed into one lateral fornix, then into the posterior fornix, and then into the other lateral fornix, elevating the uterus. This packing is continued to one side and then to the other until

the posterior fornix is filled and the edge of the external os is reached. Another strip of gauze of the same kind is then packed into the anterior fornix until the edge of the external os is reached. Then both strips at the same time are packed thoroughly into the upper part of the vagina, and less firmly into the lower half of the vagina. If desired, the patient may be left in this position, with or without a sand-bag on the abdomen, for ten to twenty minutes. This packing is left in place for twelve to twenty-four hours, during which period, when the patient is in standing position, the action of intra-abdominal pressure and the weight of the pelvic organs presses upon the vaginal packing and pelvic exudates are compressed (Fig. 104). The uterus having been lifted up and the various ligaments or adhesions having been put on the stretch, there results, after several treatments, a diminution of exudate, a stretching of ligaments and adhesions, as a result of which uteri which are retrodisplaced through shortening of the uterosacral ligaments, or which are held in fixed retroflexion either by contact adhesion or by peritoneal adhesions, may be restored to a normal position. Another benefit is the relief of sensitiveness and backache produced by inflammation, infiltration, or shortening of the uterosacral ligaments, or by the tugging of peritoneal adhesions. This method, when carried out with great care, and supplemented by the use of prolonged hot vaginal douches, and further aided by massage and bimanual stretching of the uterosacral ligaments and gradual bimanual attempts at replacing a displaced or retroflexed uterus, not infrequently gives excellent results in cases not complicated by pus formation, especially if the treatment is gently carried out and is not attempted too soon after the formation of adhesions or infiltrations. In addition, we get the markedly beneficial depleting action of the glycerin on the pelvic tissues and on the uterus and cervix.

COUNTER-IRRITATION

The abdominal wall at the so-called points of Morris may be painted with tincture of iodin, or we may apply to one or both points a mustard plaster or a cantharides plaster. These are used for the relief of pain due to chronic pelvic inflammation,

especially when due to ovarian disease, and are best applied when the pain is most severe, usually before menstruation.

A cantharides plaster two inches square is applied at Morris' points, which are situated below and external to the umbilicus. If a line is drawn to the umbilicus from the external spine of the ilium (the line on which McBurney's point is measured), a point distant one and one-half inches on this line from the umbilicus represents a point which corresponds to the lumbar plexus of the sympathetic system. The skin is washed with soap and water and then smeared with a very thin layer of vaselin and the plaster is applied. It is held in place by two cross-strips of adhesive zinc plaster and is allowed to remain in contact with the skin until a bleb is formed, which usually takes from six to eight hours. The plaster is then removed and the bleb is incised to permit the accumulated serum to escape. The plaster is then dressed by being thoroughly covered with zinc ointment, over which a gauze dressing, held in place by zinc adhesive plaster, is made. This dressing should be changed daily until the blister is healed without the loss of skin.

When electrotherapeutic apparatus is available, the high frequency current will be found superior to local applications.

Ceratum cantharadis may be used. It is spread on adhesive plaster, leaving a margin of an inch which is to adhere to the skin. This is left in place for eight hours, or for five hours only, and then followed by a hot flaxseed poultice.

Collodium cantharidatum (60 per cent.) may be applied in two or three coats with a camel's-hair brush.

Ready-made mustard plasters may be used. These may also be made by using black mustard, and flour or flaxseed meal, half and half, or by using three parts of white mustard to one part of flour. They should be applied hot for twenty minutes to one-half hour. If it is desired to apply such a mustard plaster for hours, it should contain one to three teaspoons of mustard to a poultice of flaxseed.

BIMANUAL MASSAGE (VAGINO-ABDOMINAL) IN CHRONIC CONDITIONS

Vagino-abdominal manual massage has a depletory action, through stimulation of the circulation and through stimulation

of the lymph-current. Venous hyperemia and congestion are diminished and the vessels of the uterus are contracted through the mechanical stimulation. If massage is prolonged, there occurs a secondary dilatation of the vessels. Through gentle massage the uterus becomes smaller and harder. This results from mechanical stimulation of the muscle and through mechanical irritation of the cervical ganglia.

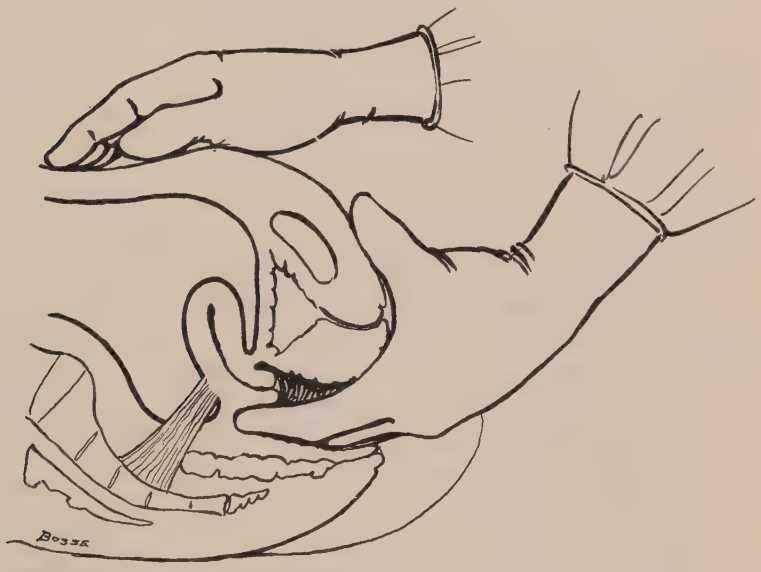


Fig. 105.—First step in stretching the uterosacral ligaments. The internal fingers back of the cervix pull the cervix upward and put the posterior parametrium and the uterosacral ligaments on the stretch. This procedure done gently and intermittently at each treatment will in the course of time, when supplemented by hot douches and by vaginal pressure-therapy, aid in so stretching the shortened ligaments that a retroflexed or retrodisplaced uterus can be brought into normal position and held there by a Smith or Hodge pessary.

The Brandt method is used for stretching pathologic bands, for lifting the uterus, and for massaging infiltrations. The patient is on the table and the two fingers of one hand are introduced as in bimanual examination. Bladder and rectum should be empty. The external hand pressing through the abdomen is brought down to the internal hand. The external hand makes light circulatory rubbings of the skin to push the intestines aside, and then continues gently deeper circulatory rubbings in the direction of the introduced fingers. In massaging exudates

the periphery should be massaged to empty the lymph-vessels, gradually passing gently toward the center of the exudate. Massage of the uterus is carried out in the same way.

The most important effect of vaginal bimanual massage consists in the purely mechanical stretching of sclerotic bands and adhesions and the loosening of abnormal adhesions. The uterus

Fig. 106.—Bimanual massage, for stretching the posterior parametrium and uterosacral ligaments. The external hand, when it can be brought back of the uterus, aids the internal fingers in performing this manipulation. Such treatment, extending over many weeks and supplemented by hot douches and vaginal pressure therapy, is often an essential preliminary in restoring a retroverted, retroflexed, or retrodisplaced uterus to the normal position, in which position it can be held by a Smith or Hodge pessary, to the great relief of backache.

and the portio are gradually lifted and pulled in various directions (Fig. 105), stretching parametritic bands or adhesions on the posterior surface of the uterus. The external hand passes over the posterior surface of the uterus, the internal fingers are applied to the portio, and gentle, steady, slight pulls of gradually increasing duration are made first in one lateral fornix and then in the other, and then in the posterior fornix (Fig. 106). The subsequent manipulation is the same, only carried out gradually

and through successive treatments, as is used in replacing the mobile uterus.

The indications for bimanual massage are old parametritic exudates, but never pyosalpinx or when there is fever. This method removes the edema in the parametrium and about the adnexa. It is especially valuable in the case of old organized sclerotic changes (Oskar Frankl).

ABDOMINAL MASSAGE

In the individual who takes a normal amount of exercise muscular contractions produce a return flow of the products of metabolism. General massage exerts the through the lymphatics same effect as exercise, but does not imply the use of physical and nervous force on the part of the patient. Massage affects the muscles, the general circulation, and the nervous system. It may be carried on upon the dry skin or, better, with the use of vaselin or cocoanut oil. In many individuals the value of massage consists in substituting or stimulating the above mentioned processes. In addition, massage has a soothing effect and a trophic influence on the nervous system. General massage is of value, especially if aided by the faradic current, in neurasthenia, in feeble states, and in nervousness (Wood).

Local massage is used to exert an effect on local conditions. Tender spots which are due to congestion or to gouty exudations, especially if aided by the faradic current, are benefited by local massage. Kneading associated with local massage affects the local circulation, stimulates muscle fibers, breaks up masses of adhesions, and causes exudations to disappear.

ABDOMINAL SUPPORTS

Elastic abdominal belts, held in place and prevented from slipping upward by straps or rubber tubing which passes between the thighs, are often of great value, especially in supporting the loose abdominal walls so often associated with gastro-enteroptosis and various degrees of hysteroptosis (Figs. 107, 108). In these cases they support all the intra-abdominal organs, give the patient a sense of elasticity, and tend to diminish pelvic and abdominal congestion and the various associated dyspeptic annoyances. In addition, a binder

is of great value after the fifth month of pregnancy in supporting the abdominal wall and the fundus of the uterus, taking the

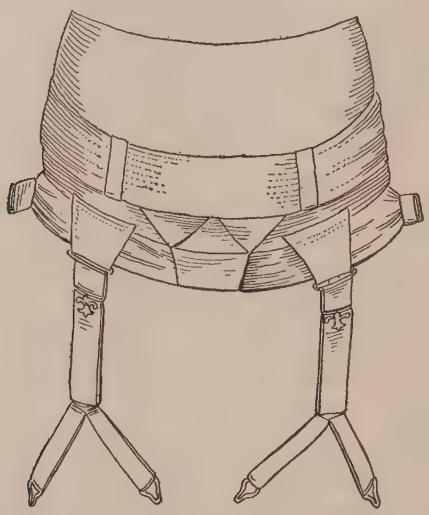


Fig. 107.—The Storm binder, one of the best of the abdominal supports for loose abdominal walls, for splanchnoptosis, and for use during the later months of pregnancy.

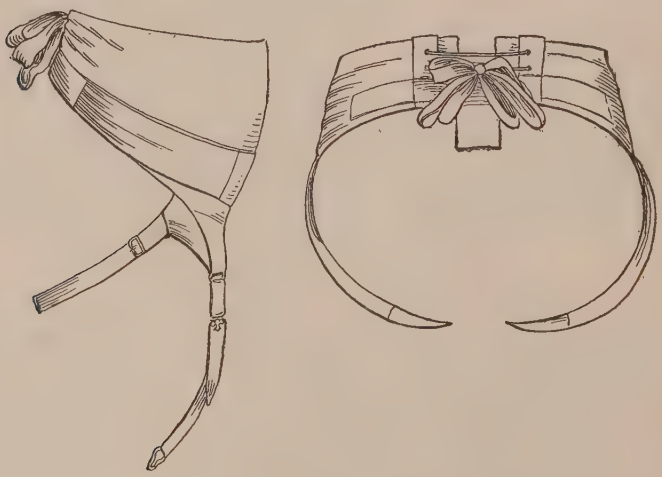


Fig. 108.—The Storm binder, side and back views.

strain of stretching off the abdominal walls. In the post-partum period, when the patient first gets up and about, several weeks

and sometimes months elapse before the abdominal wall and the intra-abdominal organs are involuted. During this period, in which Nauheim baths, the sinusoidal current, and abdominal massage are used, the abdominal walls may be supported by the aid of such an elastic abdominal belt, which in all cases should be made and fitted to the individual figure by the accurate measurements and fitting of an experienced manufacturer. To a very great degree the need of such belts is diminished by the wearing of what are known as straight-front corsets, which support the abdominal wall and lift up the lower half particularly of the abdominal contents (Fig. 109). These corsets are devised to avoid contraction of the waist and of the thorax. The ordinary straight-front corsets are harmful in the post-partum period, and they should not be permitted in the later months of pregnancy. The belt and corset should be applied while in the recumbent position. The subject of abdominal supports is fully discussed in the section on Constipation.

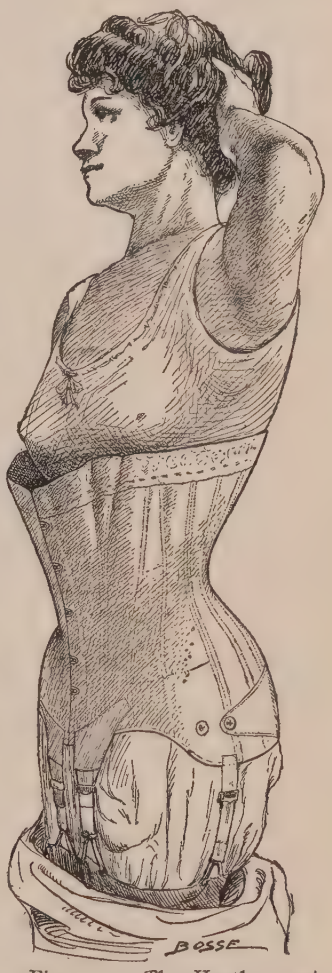


Fig. 109.—The Heath corset, one of the best of the straight-front corsets for supporting the intra-abdominal organs in splanchnoptosis. It is so loosely made in its upper half that it does not compress the abdomen, nor does it compress the thorax or breasts.

THE PRODUCTION OF PELVIC HYPEREMIA AND ANEMIA

The production of arterial hyperemia increases the nutrition of tissues, stimulates local tissue metabolism, and increases the regenerative functions. If the tissues and cells are better nourished as a result of hyperemia, and if their anti-toxic power is increased, the cells and their energy are pre-

served. The production of hyperemia in the pelvis is indicated in edematous swelling of the genitalia, in old hard exudates, in non-purulent inflammations of the adnexa in the chronic stage, in old parametritis, in infiltration of the uterosacral ligaments. Hyperemia makes scars and sclerosed bands due to parametritis and perimetritis more pliable, and renders subsequent stretching easier and less painful. It should not be induced in the presence of fever. If, however, cells and tissues are extensively involved, then the increased hyperemia and increased tissue

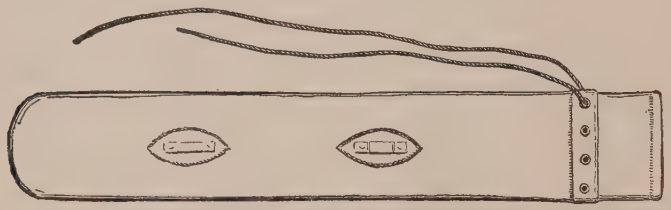


Fig. 110.—Long rubber water-bag, to be applied to the spine when filled with hot or cold water to cause either pelvic anemia and contractions of the pelvic vessels (hot water) or pelvic hyperemia (cold water). Two little straps are attached to the bag so that bands, passed through them and around the abdomen, keep the bag in place even if the patient turns on her side. The upper end is rolled in and the string is laced over it.

changes hasten the purulent degeneration of the tissues (Oskar Frankl).

The production of anemia or contraction of the vessels in inflamed pelvic organs has an antiphlogistic and depletory influence. When produced in congested hyperemic areas, it diminishes bleeding or the tendency to bleeding. It is indicated in acute inflammatory conditions, such as perimetritis, parametritis, endometritis, salpingo-oöphoritis, in hyperemia, climacteric bleedings, other bleedings, etc.

Changes in the circulation of the pelvic vessels may be produced by applications to the abdomen or to the vertebræ, by douches, by sitz-baths, and by full tub-baths.

A long water bag is of value for applications to the lumber vertebræ (Figs. 110, 111). In this location we accomplish with certainty a reflex effect on the uterus. If filled with cold water, it is used in sexual excitement, nymphomania, and for pollutions. If filled with hot water, it is of value for menor-

rhagia and metrorrhagia. Olshausen places bleeding patients on a bag of hot sand. Such warm applications to the lower vertebræ are followed by uterine contractions.

Abdominal Application

The use of the ice-bag and of the hot-water bag applied to the abdomen is too well known to require elaboration. The rules governing their application are the same as those noted below. The ice-bag should not be applied directly to the skin, but should be separated from the skin by a dry cloth or compress. It should be removed at intervals as soon as it causes local discomfort. Instead of the ice-bag, the cold coil may be used.

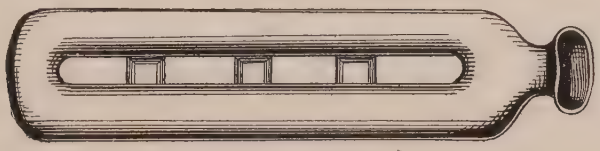


Fig. 111.—Chapman's water-bag, to be applied to the spine for the same purpose as mentioned in Fig. 110.

Cold is of value in acute inflammatory pelvic conditions. The ice coil is extremely servicable in the treatment of peritonitis.

Abdominal applications by means of moist cloths or towels are of great importance for the production of pelvic anemia or hyperemia. The moist cloths should be covered by a dry permeable towel.

Anemia in the pelvic organs can be caused by moist cool applications (under 70° F.), which must be changed often. Such applications in the region of the hypogastrium have the same effect as a prolonged cool sitz-bath. They have an antiphlogistic and depletory influence on the pelvic organs. They are used in hyperemic and acute inflammatory changes, such as perimetritis, parametritis, endometritis, salpingo-oöphoritis. Cool local applications are also used in pruritus vulvæ.

Hyperemia can be produced by warm applications, 95° to 105° F., which should be changed often. They cause hyperemia of the skin and of the pelvic organs, and hot ones (105° to 112° F.) cause a permanent dilation of the vessels. Warm and hot applications are used in menstrual colic, for old hard exudates,

in the chronic stages of inflammation of the uterus and adnexa when there is no fever, no pus, no pregnancy, and no marked bleeding. They are also used locally in vulvitis and Bartholinitis.

Hyperemia can be produced by stimulating applications which consist of cool moist cloths (under 70° F.) covered with a dry towel which is not impermeable. They are changed only every four or five hours. A Priessnitz bandage may be used. It is a broad linen band 9 feet long. The first third is moistened in cold water and wrung out. It is applied to the abdomen and the dry two-thirds are then wound around the body. Stimulating applications at first have the same action as the cool ones, but soon the moistened band becomes as warm as the blood, and a hyperemia or reaction takes place. This warm blood passes from the skin deep down and causes a dilation of the vessels and an increased flow of blood to the internal genitalia. These stimulating applications mildly stimulate tissue change and resorption in the subacute stages of inflammation, such as exudates, etc. (Oskar Frankl).

Vaginal Douches for the Production of Pelvic Anemia or Hyperemia

The value of douches is represented by the cleansing effect, by the action of the medicament contained in the solution, and, most important, by the thermic effect of the water.

The patient should lie on her back with the buttocks on a douche pan; the height of the bag should be 2 feet above the pelvis; the tube should be preferably of glass with closed ends, but with several lateral openings about the tip. Inasmuch as in prolonged douches the effect of the temperature is desired, a water-bag containing 4 quarts may be made to last a quarter of an hour, if, during the taking of the douche, the rubber tube of the hot-water bag is compressed with the fingers as soon as the hot water is distinctly felt, the pressure being released every half minute to allow fresh water to run into the vagina and to exert its thermic influence.

Anemia.—Cool douches (under 70° F.) of short duration stimulate the tone of smooth and striped muscle fibers. The musculature of the vessels is contracted by short cool douches,

but this does not last long. Cool douches are used when there is a tendency to prolapse and descent, when there is hyperemia, and when there are climacteric bleedings. Hot douches also stimulate the tone of smooth and striped muscle fibers if their duration is not too long. The vessel musculature contracts as a result of hot douches. Therefore hot douches stop bleeding, if they are not too prolonged (if taken for twenty minutes there results a subsequent relaxation of the vessel musculature). Short hot douches (105° to 112° F.) of 1 to 3 quarts are used for climacteric bleeding, for menorrhagia, and for the bleedings of uterine atony and uterine myomata. The contraction of the muscles of the pelvic floor occurs actively as a result of hot douches.

Hyperemia.—Of greatest importance is the active hyperemia produced in the pelvic organs by warm and prolonged hot douches. Associated with the hyperemia is an increase in the lymphatic circulation, with increased local tissue change and resorption of exudates. Warm douches of 90° to 105° F. in large amounts are used for spastic dysmenorrhea and for the colic of metro-endometritis if the adnexa are free. Prolonged hot douches are used up to 112° F. in amenorrhea, scanty menstruation, chronic endometritis and metritis, and subinvolution. They are contraindicated where there is fever, in fresh inflammatory processes, in the presence of purulent accumulation, such as pyosalpinx. Very hot douches, 120° F. or more, and prolonged in duration, are used for sclerotic and shrunken tissues and bands associated with dislocation of the internal genitalia, and for hard, firm exudates, in the fever-free stage. Hyperemia prepares the tissues for massage. The vagina will tolerate a much higher degree of heat than the perineum. The patient is therefore directed to smear the perineum with cold cream before using a hot douche.

Sitz-baths for the Production of Pelvic Anemia or Hyperemia

The use of this procedure, as a rule, demands a deep sitz-bath tub, with a support for the back, two-thirds full of water. The patient should wear a gown, stockings, and slippers. When seated, the pelvis up to the umbilicus and the thighs almost up to the bend of the knees are covered with water. A

shawl or blanket is thrown about the shoulders and covers the patient as she is seated in the tub. After the bath the patient at once goes into bed on an extra sheet, with which she is quickly dried, and is then covered with blankets.

A sitz-bath in which the patient is seated in a bath-tub with sufficient water to cover the body up to the umbilicus may be given as a modified form of the Nauheim bath if salt (3 pounds) and calcium chlorid (3 ounces) are added. The effect of such a bath is to influence pelvic congestion and to alter the pelvic circulation. It is, however, associated with no constitutional benefit, as in the case of the complete Nauheim bath.

Anemia of the pelvic structures is produced by a cool, prolonged sitz-bath, 50° to 65° F., duration five to thirty minutes, which causes long vessel contraction of the genital organs. The indications are climacteric bleedings, congestion of the pelvis and its associated dysmenorrhea and menorrhagia, pruritus vulvæ, and vaginismus due to neurotic disturbances. They are contraindicated in anemic and weak individuals and when there is in uterine colic.

Anemia of the pelvic structures is also produced by a tepid sitz-bath, 70° to 85° F., five to fifteen minutes, which causes a contraction of the vessels in the pelvis. It has a restful effect and can be used in weak individuals and in those who cannot at first stand the colder baths. It is useful in inflammation of the uterus and vagina.

Hyperemia of the pelvic organs is produced by a short, cool sitz-bath, 50° to 65° F., and lasting one to five minutes, which causes a contraction of the peripheral vessels and of the vessels of the pelvic organs. After leaving the bath there is a reactive dilatation of the skin vessels and of the vessels of the pelvis. This bath causes a reactive flow of blood to the inner genitalia. This short, cool bath is used in those cases in which we wish an active hyperemia and a stimulation of the motor and secretory functions of the uterus, as in amenorrhea, leukorrhea, in not too weak individuals; in hypoplasia, in asthenic uteri with metrorrhagia and menorrhagia, in chronic metritis and subinvolution. It is contraindicated in acute and subacute inflammations of the genitalia, in pregnancy, and when there is great pain.

Hyperemia of the pelvic organs is also produced by warm sitz-baths, 90° to 105° F., ten to thirty or forty-five minutes, which cause a flow of blood to the pelvis and its organs, and are used to cause a hyperemia of the genitalia, to stimulate resorption, and to exert a sedative effect. They are indicated in hypoplasia, amenorrhea and scanty menstruation, in spastic dysmenorrhea, in chronic metro-endometritis and chronic parametritis and perimetritis, in hard exudates after the fever stage has subsided, in salpingo-oöphoritis when there is much pain without fever and when there is no pus. They are also useful in the chronic stages of cystitis or tenesmus, but never for acute gonorrhea; never to be used in pregnancy, menorrhagia, metrorrhagia, or accumulation of pus in the pelvis.

ELECTRICITY

The Galvanic Current.—The positive pole (anode) has a hemostatic, anesthetic effect. It stimulates contraction, narrows the vessels, and is antimycotic. The negative pole (kathode) produces hyperemia, stimulates circulation, relaxes muscle, promotes glandular secretion, diminishes pain, and aids resorption. For the use of galvanism the following apparatus is needed:

A battery with a current up to 130 milliamperes (Fig. 112), or a slate rheostat and milleamperemeter connected with a wall plate or the street-lighting current itself.

Two sponge electrodes.

An inactive abdominal electrode of copper or lead, which should constitute a wide plate separated from the skin by a thoroughly moistened felt pad (Fig. 116).

For the vagina, special electrodes are used (Fig. 113, *a* and *b*).

For the uterus, copper or aluminum electrodes of the shape of a sound are necessary with the vaginal part made of hard rubber (Fig. 117, *b*, *c*, *d*). Olive-shaped removable tips fitted on the end of an intrauterine holder may be used, but the solid intrauterine electrodes are preferable.

Intrauterine galvanism is to be used only when there is no inflammation of the adnexa. Thorough antiseptic precautions must be taken before the sterile unipolar electrode is introduced

into the uterus. We begin with a current of 5 milliamperes and gradually increase to 10 or 15 milliamperes. More than 20 milliamperes may cauterize. Applications are made as often as necessary, usually 2 or 3 times a week. The flat, felt-covered electrode is moistened, and placed over the suprapubic or sacral region. A small cervical electrode is then

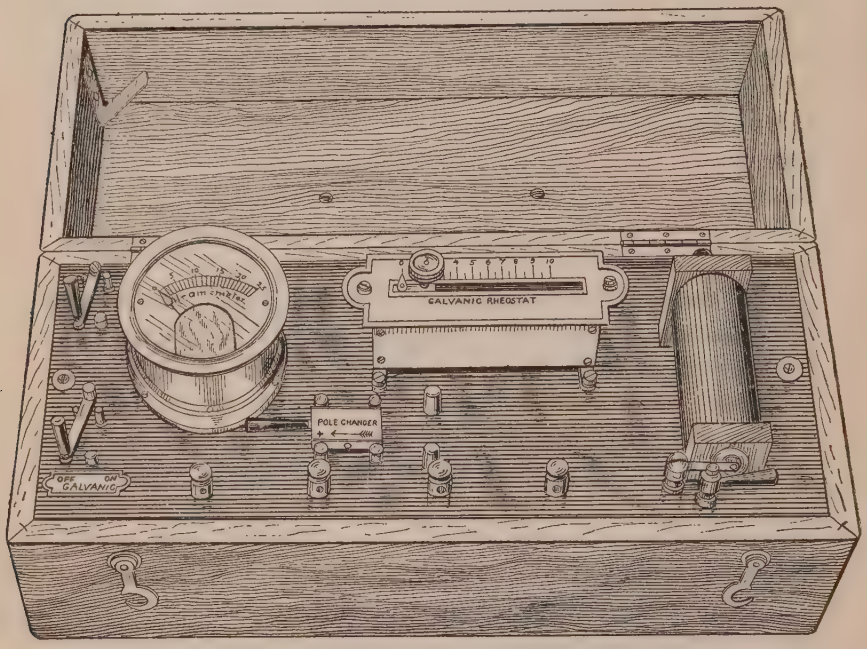


Fig. 112.—Battery for the production of galvanic or faradic current or of both currents combined The strength of the galvanic current applied is registered by the meter, and is increased by the rheostat.

insinuated into the cervical canal, and the current turned on. After a few moments the cervix will relax and soften, and as the canal dilates, gradually increasing sizes of electrodes may be substituted for the first one. A free cervical secretion is usually noted, and a specimen taken after an application of negative galvanism will frequently disclose the presence of pyogenic microorganisms which could not be detected otherwise. This method of cervical dilatation is painless and efficient, and its effects are more lasting than those of forcible dilatation. The

current is increased gradually and is gradually reduced. The abdominal and intrauterine electrodes should be held quietly and steadily. With galvanism the unipolar electrode is always used.

Indications for the Use of the Galvanic Current.—Galvanism for myomata only stops the bleeding temporarily, but improves

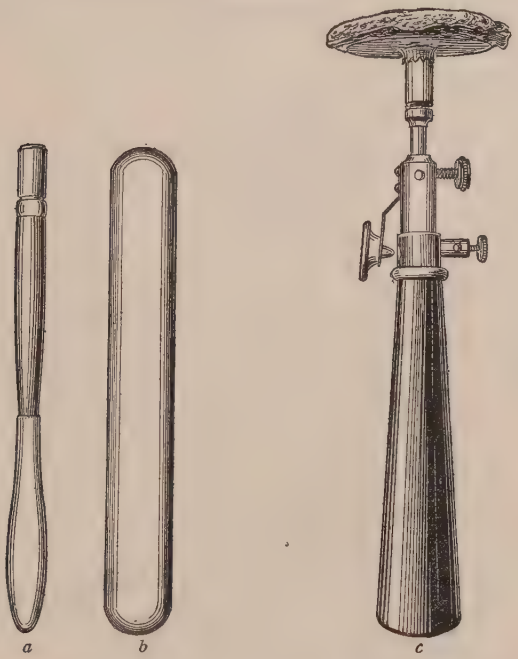


Fig. 113.—*a*, Vaginal metal electrode; *b*, vaginal non-metallic electrode; *c*, small electrode for external use (Frankl).

the nervous symptoms and diminishes pain. It does not diminish the size of the tumor. Only interstitial myomata are to be treated. The effect on subserous tumors is *nil* and gangrene of the capsule and degeneration are to be feared in the case of submucous myomata.

The *negative* electrode applied within the cervix relaxes the cervical muscle and elastic fibers, and the canal becomes dilated. At the same time a hyperemia is produced. It cleanses the canal and tends to free it of inflammatory accumulations. When introduced the full length of the uterine cavity, the hyperemia which it produces has a beneficial

effect in chronic inflammation. In cases of small undeveloped uterus it produces a hyperemia which tends to develop this organ. It is, therefore, a valuable procedure in dysmenorrhea due to cervical stenosis, in cervical catarrh, in chronic inflammatory endometritis, in pelvic inflammation not associated with the accumulations of pus, in hypoplasia, in lactation atrophy. The use of the long negative intra-uterine electrode

Fig. 114.—Intra-uterine electrode in place with small electrode on abdomen.

with current of 5 to 10 milliampères for a period of five to ten minutes, applied two or three times a week for several weeks or months, is often of service in the treatment of sterility, when the husband is not at fault, and there is no evidence of tubal or peritoneal inflammation.

The positive electrode has the power to cause uterine contractions, but its use, even with only a current of 5 to 10 milliampères, often provokes pain. Its regular application two or three times a week for several weeks, duration from five to

fifteen minutes, is of value in subinvolution of the uterus, in atony of the uterus, in fibrosis uteri associated with irregular bleedings, in pelvic congestion, and in some cases of bleeding due to fibroids. The effects from the use of the positive pole are obtained usually only after many applications. The therapeutic results desired from the use of either the negative or positive intra-uterine electrode are markedly enhanced by any form of hydrotherapy applied for the purpose of producing either

Fig. 115.—Plate electrode applied between shoulder-blades before the patient lies down on office table. The other electrode is applied to the cavity of the uterus.

pelvic hyperemia or pelvic anemia. For this purpose the sitz-bath of proper temperature is the best.

In the case of intra-uterine applications of electricity the other electrode may be a small one, applied over the region above the symphysis (Fig. 114) or to the right or left of the median line; or a large plate electrode may be applied over the lower abdomen, or over the sacral region, or along the spine between the shoulder-blades (Fig. 115). This latter point of application we have found to be a good one in nervous or neurasthenic patients,

for the pelvic effect is gained as desired, and in addition we have the actual or suggestive influence of the spinal application.

For intrauterine application we have short electrodes of a length sufficient to just pass the internal os, or longer electrodes of a length sufficient to reach the fundus. It is desirable to use eventually as large an intracervical or intrauterine electrode as possible. One should always begin with the smallest size, and the introduction of the electrode should always be carried out gently without the use of force, so as to avoid bleeding.

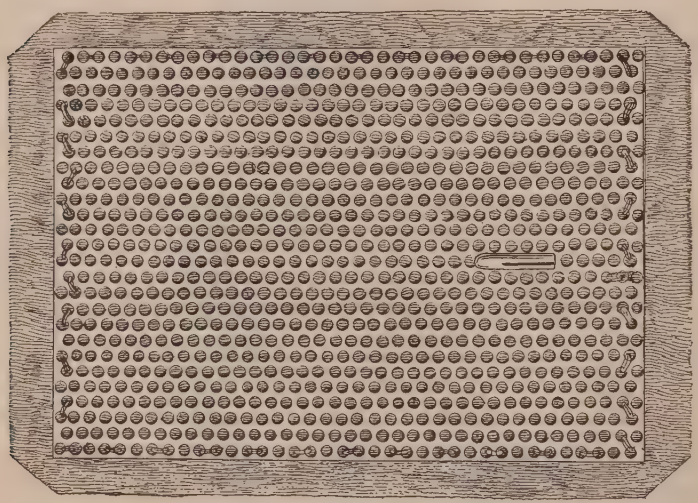


Fig. 116.—The large abdominal plate of copper or lead, with attached lining which is thoroughly moistened before being applied.

It will be found that with the use of the negative current the cervix dilates or relaxes, so that in the course of several sittings the largest size electrode may be used in many cases. When using the positive electrode the change to a larger size is not made so readily, for the cervix contracts about the electrode or the uterus contracts, and uterine colic sometimes follows.

Electricity is also of value in the treatment of constipation or abdominal subinvolution. In the postpartum stage, electricity, especially the sinusoidal current, has marked advantages.

In the treatment of constipation, if the Boas electrode is used, the other electrode may be applied in succession to various parts

of the abdominal wall, or the large plate electrode may be applied along the colon or over the sigmoid area.

For ovarian neuralgia: positive electrode in the vagina, lead plate on abdomen.

For vaginismus: positive plate on the vulva, negative on sacrum—weak current five minutes.

For pruritus vulvæ: non-metallic positive electrode in the vagina, negative for ten minutes on the affected area.

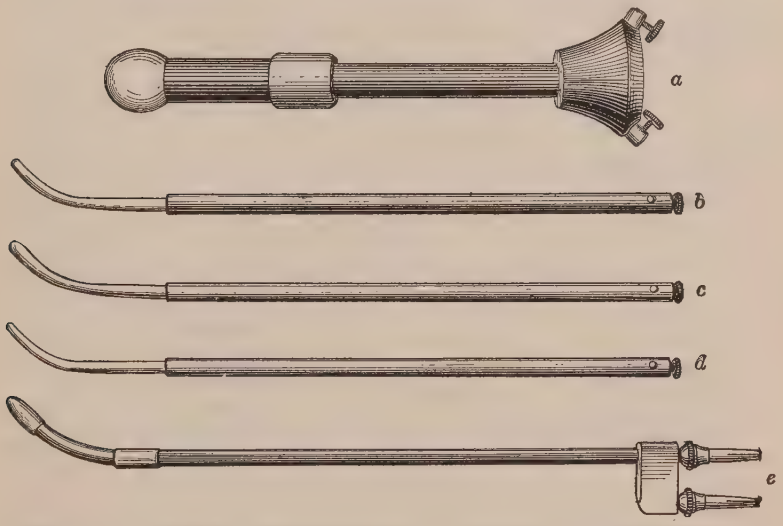


Fig. 117.—*a*, Bipolar vaginal electrode for faradism; *b*, *c*, *d*, intrauterine electrodes of different calibers for galvanism or faradism; *e*, intrauterine bipolar electrode for the faradic current.

The Faradic Current.—The faradic current (primary) causes contraction of smooth and striped muscle fiber. The secondary current acts on the nerve structures and diminishes pain.

The intensity of the current is adapted to the subjective reaction of the patient by gradual increase in strength for ten to twenty minutes.

For the faradic current the same electrodes as in galvanism are used, but bipolar electrodes, which do away with the use of the abdominal plate, may be employed. These are fitted for use in the vagina and uterus (Fig. 117, *a* and *e*). The indications are:

Subinvolution—which is treated by vagino-abdominal faradism or by bipolar intrauterine faradism to stimulate contraction.

Amenorrhea due to hypoplasia—treated by utero-abdominal faradic current or by bipolar intrauterine faradism.

Dyspareunia—vagino-abdominal current.

Ovarian neuralgia—vagino-abdominal current.

Vaginismus—bipolar faradic.

TABULATED INDICATIONS

Positive Pole (Anode)	
Hemostatic	Interstitial myoma (anode intrauterine)
Anesthetic	Ovarian neuralgia (anode in vagina)
	Vaginismus (anode on vulva, kathode on sacrum)
Negative Pole (Kathode)	
Causes Hyperemia	Dysmenorrhea (kathode intrauterine)
Anesthetic	Amenorrhea (kathode intrauterine)
	Cervical stenosis
	Cervical catarrh
	Inflammatory endometritis
	Uterine hypoplasia
	Lactation atrophy
	Pruritis vulvæ (kathode on affected area, positive in vagina)
Faradic Current	Subinvolution: vagino-abdominal or bipolar intrauterine
Contracts Muscle	Amenorrhea: utero-abdominal or bipolar intrauterine
Anesthetic	Dyspareunia, Ovarian neuralgia: vagino-abdominal
	Vaginismus (bipolar vaginal)

The value of electricity in the treatment of splanchnoptosis, in post-partum treatment, etc., is discussed in the section on Constipation.

RADIUM

Radium therapy in the treatment of some gynecological conditions, particularly cancer of the cervix, has made rapid progress during the past few years. Although the application of radium is still somewhat in the experimental stage, the dosage has not been accurately standardized, and its limitations and contraindications have not been definitely determined, its value is almost universally recognized. There is still a wide diversity of opinion as to whether radium should be used alone or in conjunction with surgery. Some enthusiasts maintain that surgery no longer has any place in the treatment

of cancer of the cervix and rely upon the use of radium alone, while others still believe that radium is practically useless as a curative agent. The majority of gynecologists are probably not in accord with either of these extreme views, and utilize both radium and surgery according to the merits of the individual case. Too much has been expected of radium in the past and its misuse has lent false encouragement and reflected discredit upon it, but those experienced in its use are beginning to appreciate what it really can accomplish and what its limitations are. It should be used in carefully selected cases only, and never indiscriminately. By the process of gradual evolution, based upon further study of the action of the rays of radium upon normal and abnormal cells, and extensive and prolonged clinical experience in the hands of competent and unbiased observers, radium will eventually find its proper place in our therapeutic armamentarium.

Therapeutic Properties.—Radium is obtained by the disintegration of uranium, the mother metal, and is the source of three different rays: alpha, beta, and gamma. The alpha ray does not penetrate tissue and has no therapeutic value. The beta ray affects only about 1 mm. of tissue, is extremely irritating, and frequently causes sloughing; it is used for superficial lesions only. Occasionally, however, the hard beta rays are used in needle therapy. The gamma ray will penetrate at least 10 cm. of tissue, and ofttimes further, and it is this part of the latent energy of radium that is utilized in the treatment of gynecologic conditions.

Radium is used in two ways: (1) one of the salts of radium, effectively screened, is brought in direct contact with the tissue, or (2) the emanation is collected from a radium solution by a machine and compressed in glass tubes, which can be applied to the tissue. These tubes, however, become virtually useless after five and one-half days. When radium bromide, the salt most frequently employed, is used, 40, 50, or 60 milligrams are enclosed in a glass capsule, which blocks the alpha rays (90 per cent. of the total). This in turn is surrounded by 1.5 mm. of brass, silver, gold or platinum, which obstructs the beta rays (9 per cent.). The gamma rays alone (1 per cent.) then pass the

glass and metal screens. Radium salts can also be enclosed in needles of different sizes, which can be thrust into the tumor mass or adjacent tissue, and these have done much to enhance the efficiency of radium applications. Each needle contains from 5 to 12 milligrams of radium.

Gynecologic Conditions Amenable to Radium.—These may be enumerated as follows: carcinoma of the uterus, fibromyomata of the uterus, myopathic hemorrhages, endocervicitis, benign and malignant growths of the external genitalia, and pruritis vulvæ. The object of applying radium to a growth or diseased area is to destroy the pathologic condition without injury to the surrounding normal tissues.

Action of Gamma Rays upon Tissue.—Ewing has described the effects of radium upon tissue as follows:

"Within three to five days after the application in the cervical canal of 300 millicuries of radium emanation in a platinum tube, there is hyperemia of the tissues, beginning exudation of lymphocytes and polymorphonuclear leucocytes, and swelling of all the cells. In the second week, the cords of the tumor cell present a characteristic appearance. The nuclei are swollen, homogeneous, and hyperchromatic, the cells loosened, and fusion giant cells form. In the third week, the number of cells are greatly reduced. Many appear to suffer necrosis; others are invaded and mechanically broken up or compressed by lymphocytes. From the fourth to the fifth weeks, only nuclear fragments or an occasional giant cell are visible, or no traces whatever remain. Meantime, the stroma has been active and appears to take an important part in the process. Leucocytes become over-abundant, the capillaries proliferate actively, and the stroma is transformed into granulation tissue in which numerous new capillaries penetrate and excavate the tumor cell nests. The gathering of leucocytes, lymphocytes, plasma cells, and polyblasts in the later stages of radium reaction may be extremely profuse, and in this respect the reaction is somewhat specific. Eventually the site of the tumor is occupied by granulation tissue, from which slight serous and cellular exudate is discharged. Later, epithelium grows over the denuded surface, completing the repair. All manner of variations occur

in the reaction of tumor tissue to radium. Complete simple necrosis follows over-action of radium. Bulky tumors may present large areas of simple necrosis, in which cysts form by liquefaction. The stroma as well as the tissue is destroyed, in which event extensive scarring will result."

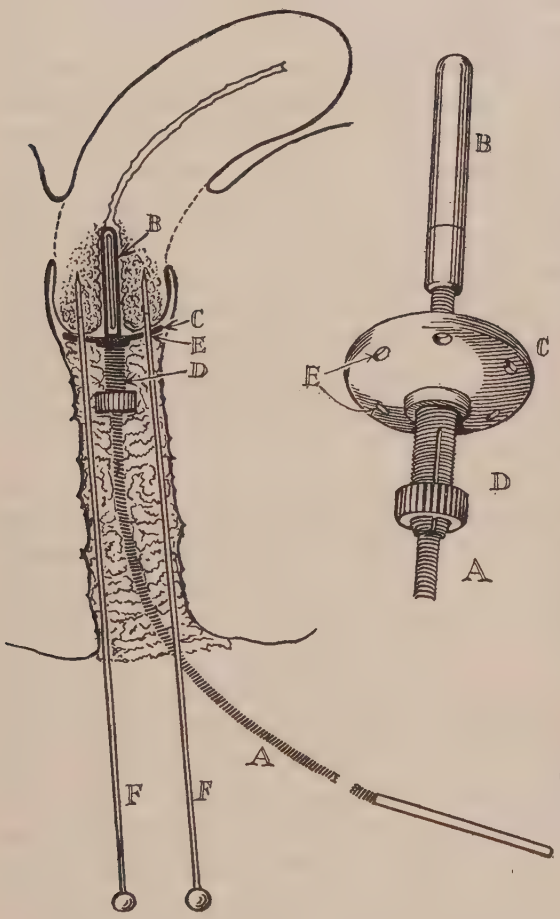


Fig. 118.—Intrauterine radium applicator. Devised by Dr. George S. Willis. This consists of a flexible wire tube (*A*) on the end of which is a silver capsule (*B*) 4 cm. long and 4 mm. in diameter, with walls 1.5 mm. thick. This capsule contains a 50 mg. radium tube. On the wire tube is a sliding metal collar (*C*) with a set screw adjustment (*D*). The collar is slipped along the wire until it rests firmly against the cervix and is fixed by means of the set screw. The collar has six holes (*E*) near the periphery, which permit the introduction of radium needles (*F*) into the growth. Thus a combined radiation with radium needles and tubes is made possible. The position of the apparatus is further maintained by firmly packing the vagina with iodoform gauze.

Selection of Cases and Preliminary Study of the Patient.—Two prerequisites for successful radium treatment are that the growth be accessible to the influence of the rays of radium, and that the vital resistance of the patient be such that she can tolerate the treatment. Having in mind the extensive cell

destruction following radium applications, and the subsequent absorption of the products of cell disintegration, it is evident that the presence of so much foreign protein material imposes an added burden on the renal excretory function, and that a preliminary study of the patient's metabolic activities and powers of elimination is as important before radium treatment as before operation, so that the effect of the toxemia and increase in nitrogenous elements may be anticipated. Pronounced anemia, impaired renal function, or abnormal hematogenous retention of excrementitious products, are contraindications for vigorous radium therapy, until these derangements have been corrected. Blood transfusion, treatment of kidney lesions, and other corrective measures may be necessary before radium is used. Each patient must be considered as an individual problem. The following are essential before radium therapy: (1) general physical examination, (2) urine examination, (3) renal function test, (4) blood count and hemoglobin estimation, (5) study of the blood chemistry, and possibly (6) removal of a small section of tissue for microscopic diagnosis.

Dosage.—In the case of radium salts, the dose is expressed in milligram hours. Milligram hours are the number of milligrams of radium used, multiplied by the number of hours the substance is left in contact with the tissues. For example, 60 milligrams of radium applied for 24 hours = 60 × 24 = 1440 milligram hours.

The dose of the emanations collected in tubes is expressed in millicuries. A millicurie is the amount of emanation derived from one milligram of radium in equilibrium.

Unfortunately, no fixed rules can be formulated for the application of a specific dose for a particular lesion, of a given kind and size. It is necessary to consider the patient herself, as well as the character and extent of the lesion to be treated. The doses vary according to the vital resistance of the patient and her ability to cope with the absorption of foreign proteins. Patients with decidedly impaired renal function, a red cell count of less than 3,000,000, hemoglobin less than 50 per cent., or marked retention of urea nitrogen or creatinin in the blood, are not candidates for vigorous radium treatment.

The usual doses administered for the several pathologic conditions treated will be discussed under their various headings in the later chapters.

INFLUENCE OF COOL AND COLD WATER APPLIED TO THE BODY

Winternitz and his school have taught us the effect of water of different temperatures, and we have in hydrotherapy a powerful oxidation therapy whereby, through thermal and mechanical influences, activity and function, hunger and revulsion, can be produced in the cell. Hydrotherapy is a powerful curative method, since thermal and mechanical processes are the normal stimuli which arouse, strengthen, and regulate our organic functions in a physiologic way. An important effect of hydrotherapy results through its influence in *changing and altering the blood distribution*, through the withdrawal of blood from congested and overloaded organs, whereby circulatory disturbances may be corrected. The value of such a change and its influence upon congestions in the pelvis may be recognized when we consider that, next to the peripheral, the region of the pelvic vessels with their large venous plexuses is one of the most important elements in regulating blood-distribution and blood-pressure. Since the blood-channels and lymph-channels furnish the material for the organic functions and for the nutrition of the organs, the circulation of any part is one of the most important factors in preserving its tone.

The use of cool and cold water influences also a change in the morphologic character of the blood. It causes not alone an increase in the number of leukocytes, but likewise a decided increase in the number of red blood-corpuscles. A necessary factor in obtaining this result is the production of a decided hyperemia of the skin. If the skin remains cool for a considerable time, and if a *complete reaction* is not excited, this change does not result; for then these cells, probably preformed blood-cells, do not enter the general circulation. Since after warm baths the increase in the number of erythrocytes is much less, this increase rests clearly upon changes in the circulation, in the heart's action, and in vessel tonus and tissue tonus. The blood richer in cells, richer in oxygen, makes the entire tissue

change more complete, and causes an increased consumption of oxygen and an increased giving off of CO_2. The resulting increased production of heat is reflexly regulated, and not by the degree or amount of heat withdrawn, but by the degree of the thermal nerve stimulus. Increased tissue metamorphosis is brought about reflexly through the influence of cold.

The combination of cold with a mechanical stimulus increases the reaction. Cold water causes a contraction of the peripheral vessels and brings about, through thermal stimulation of the vagus, a slowing of the pulse, increases the oxidation processes in the body, and exerts a stimulating effect on the central nervous system. An important result of the contracting influence of cold is the increase in the venous tonus. Since cold temperature opposes the dilation of the peripheral vessels, mechanical stimuli are necessary to bring about a dilation, so that in hydrotherapy the mechanical stimulation, frottement or rubbing, must be combined with a thermal procedure to bring about peripheral relaxation; for only with the resulting sinking of the tension and of the blood-pressure (reaction) comes a feeling of well-being, and only those thermal processes can be considered trophic which influence the heat balance of the body, and only those can be considered tonic which lead to reaction (Winternitz).

Prolonged cool half baths, taken in a sitz-bath-tub with the water reaching to the umbilicus, or cool sponge baths are used for nymphomania and for pollutions.

In anemia and chlorosis and mild neurasthenia we may use short procedures with water, which do not extract heat and which are combined with mechanical rubbing to produce a reaction. We may begin with sponge-baths at 70° F., followed by rubbing of the body with a rough towel, and diminish the temperature by a degree or two every other day. This may be substituted at later periods by a more general rubbing with water or by tepid shower-baths. Sponge-baths and rubbings are of value to accustom patients, especially chlorotic and obese girls, to subsequent full baths.

Ablutions, drip sheet, half-bath, and **wet pack** are of value in chlorosis, anemia, and mild neurasthenias.

The half-bath is of great value for reducing temperature, but has an important indication after the application of the wet pack. A modification of the half-bath after the wet pack consists of a tub, quarter full of water at a temperature of 90° to 85° F., actively set in motion by the hand of the patient and attendant. Duration six to eleven minutes, after which the patient is covered with a warm sheet and dried (Baruch).

A warm full bath causes an increase in the rapidity of the pulse, which persists after the bath. This occurs through its influence on the peripheral nerve-supply, which reflexly acts upon the vagus center, and which stimulates the accelerates of the vagus. Very warm baths can, through weakening of the venous tonus, cause an increased resistance in the minor circulation, whereby, in spite of increased work on the part of the heart, no bettering of the circulation results. This is a weakening influence, since the heart is sufficient only when it is able to force the blood to the most distant organs, in whose capillaries alone tissue metabolism takes place. A very warm full bath causes usually no increased demand for nutrition and exerts no stimulating effect on the central nervous system.

A full bath of tepid or warm temperature, from 85° to 95° F., relieves congestion of the genital organs, eases pain, and is conducive to sleep and rests the patient. During a menstrual period it diminishes the loss of blood. It is valuable in the treatment of the congestion and nervous symptoms of the climacterium in spastic dysmenorrhea, sleeplessness, excitability, etc.

The vasomotor disturbances (flashes) of the climacterium are benefited by baths of a duration of fifteen to twenty minutes and of a temperature of 90° to 100° F. They diminish the blood-pressure.

Chlorosis and anemia have been treated with benefit by warm baths which add heat to the body, and which by withdrawing fluids from the body increase the hemoglobin and the red blood-cells.

Full baths, lasting twenty minutes to one-half hour, are given three times a week at a temperature of from 95° to 105° F., and are followed by a cool rubbing or douche. Combined with these baths, rest and iron are of importance.

Reduction in the quantity of water-soluble vitamins in the diet of rats, results in total degeneration of all the germ cells, but does not interfere with growth and development in other respects; the Sertoli cells persist (Ezra Allen).

In the male, this atrophy of germ cells is accompanied by hypertrophy of the interstitial tissue. The type of degeneration in the male germ cells is like that produced by x-ray treatment of testis directly.

McCarrison: "One of the most remarkable results of foods deficient in vitamins is the constant and very pronounced atrophy of the testicles. It occurs in extreme degree, whether the dietary is exclusively composed of auto-claved rice or whether butter and onions are added; in the latter circumstances the atrophy is slightly less extreme. It appears then to be one of the most specific of the effects of avitaminosis in pigeons. . . . Histological examinations shows a complete cessation of the function of spermatogenesis."

Houlbert: "Experiments in chickens showed that when they were deprived of vitamins in their food, the birds showed an arrest of growth and of the development of the secondary sexual characters (spurs, comb and tail feathers) and progressive anæmia. On post-mortem examination, all organs appeared normal except the testes, which were very small and on histological examination showed an arrest of the cellular divisions and metamorphoses which normally occur in the seminal tubules. The interstitial cells of the testes showed a very pronounced infiltration of pigment which occurs in the interstitial cells of glands whose endocrine glands are in decline. Sections of the suprarenals show an arrest of development of the chromatin cells."

Professor Wilhelm Stepp has well outlined the general knowledge concerning vitamins.

Vitamin A.—Vitamins, those accessory organic nutritional elements in our diet, belong neither to proteins, carbohydrates or fats, yet are absolutely necessary to growth and health. Absence of the three known vitamines from the diet is the cause of the so-called "deficiency diseases."

Vitamins play an important role in the life processes of plants (Embryo plants, especially B, and Seed, especially C).

They are essential to us because they are not created nor synthesized by us. We know little about the three vitamins, A, B, and C.

Vitamin A. (McCollum, T. Osborne, L. Mendel) resembles the cholesterins and the lipoids. Whether this be one, or a series of chemical substances, it is soluble in fats (also alcohol and ether); it can be extracted from animal and vegetable tissue by alcohol and ether. Every active vitamin A is associated with cholesterin, phosphate, lecithin. Eggs, which are very rich in cholesterin and phosphates, are especially rich in vitamin A.

It is found in animal fats, full milk, green vegetable, fats and oils. There is much in milk fat, suet (especially kidney fat) in liver, cod liver oil, yolk of egg; very little in lard.

The amount of A in certain vegetables is in proportion to the depth of yellow color (carrots and tomatoes). The same holds good for butter; the yellower, the more of vitamin A it possesses.

The amount of A in milk and eggs depends on the food of the cows and hens. More is developed from fresh and green fodder than from dry.

The digestion and oxidation of too much casein develops phosphatic acids and these, combining with the calcium, deprive the bone of calcium. Too little A may be the cause of phosphatic stones in the urinary tract.

The foods richest in A are likewise richest in calcium: milk, yolk, vegetables, butter, oatmeal. A is necessary to a proper assimilation of calcium.

Rickets is due to too little A and too little phosphates. The calcium absorption in rickets can be increased by the juice of carrots. Fresh air, exercise and sunlight are likewise

necessary. Sunlight increases the phosphatic percentage of the blood just as cod liver oil does without the sunlight.

Absence or diminution of A stops development and growth: the weight remains stationary or diminishes. (Of course the water soluble B and C are also needed.) Vitamine A is essential to the normal nourishment of the cornea and to the development of the osseous system.

Lack of A affects, notably, structures nourished, not by blood vessels, but by lymph vessels, especially cornea and cartilage.

Vitamin B.—Vitamin B is found in yeast, especially in unicellular organisms which increase rapidly. It is present in cereals (kernel bearing cereals or legumes); especially present under the cellulose membrane. In rye, B is found in the whole kernel. It is present in potatoes, but not overmuch; found in carrots, spinach, kohlrabi, cabbage and little in beets. It is present in beans and peas, tomatoes, oranges, lemons and grapes. It is present in milk, eggs, liver, kidneys, brain. There is some in apples and pears, little in bananas, meat and fish.

The juice of oranges, lemons and grapes contains as much B as milk.

Polished rice and white bread are almost free of B.

Long heating under pressure, especially with alkaline reaction, is injurious to B.

Vitamin B (Funk) is essential to the peripheral nervous system, motor and sensory. A lack of B causes alimentary dystrophy, diminished appetite, and metabolic disorganization.

Beri-Beri in the human being greatly resembles the symptoms produced in animal experiments by withholding B. An instance is the polyneuritis gallinarum.

The influence of B resembles the reactions produced by pilocarpin, neurin, muscarin, cholin.

Lack of B diminishes Hcl secretion. It diminishes digestion and absorption. Lack of B diminishes or lowers the point of assimilation in the cells, and diminishes the oxidation processes in the cells.

B stimulates fermentative processes.

B increases metabolic processes. Too many calories and too little B lead to obesity. Cod liver oil is often of benefit, when spinach is not.

Vitamin B is especially present in dried yeast.

Vitamin C.—Vitamin C is soluble in water and alcohol. It is least resistant to external influence, such as high temperature. As with B, high temperature is very injurious, especially with alkaline reaction (preserves).

Dried vegetables readily lose C. Milk and fruit juices, if dried quickly, do not lose so much of the C. Mother's milk is not rich in C.

Scorbutus is cured by fresh vegetables, and by cabbage, kohlrabi, watercress, dandelion fruits, especially oranges and, lemons, by tomatoes, raspberries. Vitamin C is present in potatoes, less in carrots. Much C is present in milk and eggs; always more C in very fresh vegetables than when old and dry.

Loss of C affects the endothelium of vessels and leads to hemorrhagic diathesis. The young organism needs C (also A) more than does the adult.

At the moment of development of plant seed, much C is formed. Too little C renders children and adults non-resistant to infectious diseases.

Birds need B and not C.

Lack of A, B, C, diminishes the resistance to infectious diseases.

B and C are possibly related to the assimilation of inorganic salts.

B and C are found in potatoes, but not A.

Legumes or cereals have no C.

In rye, B is present throughout the entire kernel.

Legumes have much B.

Spinach, salads, cabbage, and green vegetables, have A, B, and C. Roots, such as carrots, have all three.

Fruits have A and B. Tomatoes, especially A.

Milk and eggs have all three, depending on the food received by the giver, especially the mother of the baby.

Liver and brain have much B. Animal fats have A, especially cod liver oil. There is very little in lard.

THE ENDOCRINE GLANDS

In health and disease, body processes involve the action of ferments, enzymes, vitamins, hormone; the reactions of chemotaxis, anaphylaxis, toxins, and anti-toxins; the reactions to inflammations, intoxications, injected vaccines, anti-toxins, etc.

In the lowest forms, before the development of a central nervous system, co-adaptation of functions is activated by chemical means. For instance, chemiotaxis explains the movement of phagocytes, the chase for food, escape from obnoxious environment, the approach of sexual cells, etc. A plasmodium turns away from boiled water and creeps towards an infusion of dead leaves (Vincent).

As differentiation proceeds, the chemical stimulants, or hormones of the body, become concentrated and specialized in certain ductless glands. The close association between reproductive and endocrine glands is thus based deep in evolution. The development of a nervous system enables response to be much more rapid than can be achieved by simple chemical reaction. Now clearly the first purpose for which rapid response would become most vital is that of self preservation. The sympathetic nervous system is specially adapted for rapid and widespread reaction in the struggle for existence. It is only to be expected that this newer express route would be evolved in connection with the more primitive mechanism, so that as both endocrine glands and the sympathetic nervous system become specialized *they remained associated.* This association is reciprocal, as not only does the sympathetic nervous system stimulate the secretion of these ductless glands, but their secretion increases in turn the sympathetic response. Thus the sympathetic nervous system, the endocrine glands, and the gonads form a basic tripod entrusted with the duty both of the preservation of the individual and the continuity of the species. Their relationship is shown in disease as well as in

health, and is reflected in many of the "neuroses and psychoses" (Langdon Brown).

The autonomic nervous system regulates, controls and expresses instincts and emotions, and is relatively little under voluntary regulation, especially in the earlier years. In man, with his highly-developed complex organism, including this dominating and controlling autonomic system, chemical substances produce action and reaction in and between cells, structures, organs, autonomic nerves, nerves and nerve centers, with the resulting inter-action, co-ordination and balance essential to physical and mental well being.

The endocrine system dominates physical and mental development. All our internal, complicated chemical processes, from birth onward, cause and create humoral and physical differences which may be apparent, unrecognized, or not determinable (Vincent). The same principle holds good with regard to nerve and psychic processes. Psychologically, too, there is conscious and unconscious memory of all impressions registered since birth. This is especially true of the instinctive and emotional reactions which depend so much on the activity and relationship existing in and between the various divisions of the autonomic nervous system. The internal secretions, it must be remembered, are intimately associated with, and exert a profound influence on the autonomic nervous system.

We are a bundle of chemical combinations. Richet says: "The living being is a chemical mechanism and perhaps it is nothing more."

"The chromaffin cells appear to originate in the central nervous system and in the segmented worms they remain there. When, in evolution, the sympathetic cells emigrate from the central nervous system into outlying ganglia, they are accompanied by the chromaffin cells. In the lowest vertebrates (Ammocœtes) masses of them are still found close against the cells of the posterior root ganglia. . . . As we pass from the lowest to the highest vertebrates, the sympathetic cells become more numerous and the chromaffin cells diminish in number, until at last in the mammalia the sympathetic system is fully developed,

and the chromaffin system reduced to the cells found in the medulla of the adrenals" (Gaskell).

"The evidence of embryology and comparative anatomy thus points strongly to the conclusion that the sympathetic nervous system arose from nerve cells containing adrenalin . . . and that when these cells left the central nervous system to become peripheral, they left not as single cells, but as two separate cells, one of which contained all the adrenalin and formed the chromaffin system, and the other the nerve cells of the sympathetic system of the vertebrate" (Gaskell).

"This throws a flood of light on the meaning of the adrenals. It explains why in them alone the connector fibers end, and prepares us for Langley's generalization that the effect of adrenalin on any part is the same as the stimulation of its sympathetic nerve. For the chromaffin cell represents the excitor element."

"The sympathetic, as the defensive mechanism of the body, preeminently needs the power of rapid response, but the chemical stimulant is still retained. The sympathetic excites a secretion of adrenalin and adrenalin increases the sensitiveness of the response to the sympathetic."

Various substances and materials are formed by the metabolic activities of protoplasm and of the intra-cellular enzymes of living protoplasm. The blood which leaves an organ or tissues by the veins, contains different chemical substances than entered by the arteries. All animal tissues impart to watery or saline extracts substances which, when injected, affect the arterial pressure. The infundibulum of the pituitary, and the chromaphil tissues are the only two in the body, an extract of which produces pressor effects. Extracts of all other organs and tissues, especially nerve tissues, contain depressor substances. This laboratory fact does not necessarily signify a physiologic process, but is an indication of the chemistry of protoplasm and tissues (Vincent).

The products of cell metabolism enter the lymph and blood channels to be carried to the various organs of the body for use or for excretion. When the product of cell metabolism is of on

service, it is cast out in the various organs, upon a surface in the interior or exterior of a body.

Brown-Sequard, in 1889, in his work on testicular extracts, stated that all tissues give off something or other to the blood, which is characteristic, specific, and of importance to the body in general.

A secretion results from the production of certain materials by cells. A gland is a structure of special cells forming a product discharged upon the skin or mucous membrane, or into lymph or blood channels, or into serous spaces.

Some are inclined to restrict ductless glands to "secretory cells are highly specialized epithelial cells, sending directly or indirectly into the blood, chemical substances supplying a need or destroying harmful substances."

The spleen and lymphatic glands are not composed of epithelial secretory cells, and are classed among the "hæmo-lymph" structures. The thymus, while epithelial in origin, becomes largely changed into a lymphoid organ. The liver, kidney, intestinal glands, gastric glands, pancreas, etc., have an internal secretion as well as an external. Seminal fluid, coming from the testes and accessory glands, is a secretion for the support and transport of spermatozoa; yet the internal secretion of the cells of Leydig acts as a most essential internal hormone. Some internal secretion of the liver, for instance, renders innocuous the end products of protein metabolism. The glycogenic function is especially related to and influenced by the secretion of the pancreas and adrenals and the thyroid and pituitary. Little is known of the changes in the cells pointing to the act of secretion in chromaphil cells. They are not epithelial and some say, not secretory, and many doubt if they have a secretory function (Vincent).

We know that, broadly speaking, the so-called ductless glands, control growth and differentiation through their hormones, act directly on cells, nerves, nerve ends; regulate functions, control interaction; have a decided effect on the autonomic nervous system, and are intimately related to the processes involved in the instincts and emotions and the psyche. Many of the chemical substances and chemical changes and reactions

are already known, and in due time the specific character of the various hormones, and the involved chemical inter-relations from simple cell metabolism up to memory and thought will be definitely established.

"The higher centers of the brain show their influence on the lower chiefly in the direction of inhibition. The highest organism is the most controlled, but the sympathetic cannot be thus controlled. Evolved in a subconscious plane, the sympathetic nervous system remains forever beyond the control of the will. Though we may deaden the emotion, we cannot prevent the response to an emotion once evoked. To regulate this we must trust to reserves, inherited and maintained through generations of stable and equable ancestors. Herein national characteristics will tell in the future, as they have in the recent past, for just as character is revealed in the instinctive response which occurs more quickly than conscious thought, so the powers of tenacity and endurance may be foreshadowed in the original emotional response" (Langdon Brown).

In Herbert Spencer's phrase, "the cessation of automatic action and the dawn of volition are one and the same thing." Inhibition would appear also to connote a diversion rather than a stoppage of the stream of nervous energy, since, as McDougall shows, it is the complementary result of a process of increased excitation in some other part.

In the first part of our lives we live more or less as we feel. In the second part of our lives, nature wants us to live as we think. That constitutes maturity; the control of our emotional side by the judgment of experience.

PANCREAS

The action of the pancreas shows the interplay of chemical substances through the medium of the blood channels and lymph channels, even though reflex nerve paths are concerned.

An important part of gastric secretion is caused by a nerve mechanism through vagus secretory fibres. But these first products of digestion, plus the hydrochloric acid, develop in the epithelial cells of the pyloric mucous membrane a gastric

secretion which is absorbed into the blood stream and then, by direct contact with cells, excites all the glands of the stomach to secretory activity.

The passage of food into the duodenum greatly stimulates the secretion of pancreatic juice. Reflex action, produced by the gastric juice, is said to play a part in stimulating the pancreas. But, under the influence of the acid of the gastric juice, a chemical substance is formed in the mucous membrane of the upper small intestine (duodenum) and, carried by the blood to the cells of the pancreas there stimulates the organ to secretory activity. This substance is called secretin and is produced from the prosecretin of the intestinal epithelium by the gastric juice. Thus the internal secretion of the duodenum produces the external secretion of the pancreas. This secretin is said, likewise, to stimulate the secretion of succus entericus, which converts trypsinogen into trypsin.

Whatever their origin, the islets of Langerhans of the pancreas constitute part of the pancreas concerned with carbohydrate metabolism, the fixation of glycogen in the liver, and the metabolism of sugar in the body; and these islets do this by virtue of an internal secretion absorbed by the blood or lymph channels.

Though the islets may not be the only part of the pancreas producing an internal secretion, functional inactivity of these islets and absence of their specific secretion, are probably the cause of hyperglycemia and diabetes. Hyaline degeneration, atrophy, inflammation of the islets, have been found in diabetes. The relationship between the function of these islets on the one hand, and their reaction to the specific activity of the thyroid, the adrenal medulla, and possibly the pituitary, form one of the interesting phases of interglandular association.

The sympathetic nervous system is in intimate relation to the endocrine glands. "It is both interesting and suggestive to note that an important group of endocrine glands—the adrenals, the thyroid, and the pituitary—have three features in common; the secretion of each is stimulated by the sympathetic, they all lower carbohydrate tolerance, and they all act and react with the reproductive organs" (Langdon Brown).

Diabetes. "No theory of diabetes is adequate which leaves the sympathetic nervous system out of account (Langdon Brown).

"The following general statements may be said to have passed beyond the stage of hypothesis to that of established fact:

1. Sympathetic stimulation increases blood-sugar as a defensive measure.

2. Sympathetic stimulation causes increased secretion of adrenals, thyroid, and pituitary.

3. Vagus stimulation excites secretion of the pancreas and, on the generalization of the opposing actions of the para-sympathetic and sympathetic, it would appear probable that sympathetic stimulation inhibits the secretion of the pancreas. The antagonism between its internal and external secretions does not mean an antagonistic nervous supply: it means a diversion of nervous energy from one channel to another.

4. The general effect of sympathetic stimulation is katabolic, and mobilization of blood sugar is a preparation for katabolic action.

5. Therefore the sympathetic, both by increasing the secretion of glands which diminish carbohydrate tolerance and by inhibiting the gland which increases carbohydrate tolerance, would raise blood-sugar above the leak point, and glycosuria would result.

There is, then, a sort of antagonism between internal and external secretion of the pancreas. Treatment by alimentary rest (Allen) means that the lessened work thrown on the external secretion helps to restore the internal secretion. I think, therefore, that the practical benefits of the fasting treatment may be regarded as supporting the pancreatic origin of spontaneous diabetes.

The dilation of the pupil within twenty minutes to one hour after instillations of two separate drops of liquor adrenalin hydrochlor, with an interval of five minutes between them, is considered by Loewi to be another sign pointing to insufficiency of the pancreas. He noted this occurred in depancreatized animals, and referred it to a loss of balance between the antagonistic internal secretions of the adrenal and pancreas. The internal secretions of these glands are certainly antagonistic

in their effects on sugar metabolism, and Pemberton and Sweet have shown that even the external secretion of the pancreas is antagonized by the adrenals. This test is also positive in hyperthyroidism because the adrenal action is then reinforced at the expense of the pancreas.

"To sum up the relations between this group of endocrine glands and the sympathetic nervous system, we may say that the secretion of the three tends to raise blood sugar and lower carbohydrate tolerance; the adrenals co-operate with the sympathetic in every way, so that the injection of adrenalin imitates the effect of stimulating the sympathetic nerves; the thyroid aids all the katabolic activities of the sympathetic; while the pituitary plays a large part in controlling the excretion of urine. The secretion of the first two is not only excited through the sympathetic, but in turn increases the response of other structures to such stimulation; this reciprocation has not been observed in the case of the pituitary" (Langdon Brown).

Insulin.—Banting and Best, with their attention fixed on the islands of Langerhans, tied off the pancreatic ducts in dogs. At the end of seven weeks, all of the pancreas was found to have disappeared except the islands; the acinous tissue apparently having been digested by its own secretion. From the remaining tissue, the islets, an extract was made, and by its use, depancreatized dogs, who usually survive only two or three weeks, were kept alive for seven weeks. This extract, insulin, administered in large doses, not only caused the glycosuria and hyperglycemia and acetonuria to disappear, but even induced a hypoglycemia. The animals in the state of hypoglycemia appeared hungry, lay huddled up, were extremely sensitive to noise, and evidenced alternating convulsions and coma. This state disappeared in a short time on the administration of glucose.

It was found that insulin, thus prepared, was not free of protein products and other injurious substances.

Another method was tried. An attempt was made, by the use of freshly prepared secretin administered to the dogs, to keep the acinous part of the pancreas so active for seven or eight hours that this portion of the tissue would be, so to speak,

exhausted. Extracts made from such a pancreas yielded, in some cases, an extract of insulin little contaminated by the undesirable admixtures. This was not always so and was an uncertain source of the internal secretion desired.

An extract was then obtained from the pancreas of calf embryos (fourth or fifth month of gestation) when the pancreas consists almost entirely of islets. This was an excellent but a difficult source of supply. Recently it has been found that from beef pancreas, by means of alcohol, 90 per cent., mixed in equal parts with dilute hydrochloric acid, which renders the acinous ferments inactive, insulin can be obtained free of protein admixture, free of other contaminating products and, what is especially to be desired, free of the secretion of the acinous portion of the pancreas, for the trypsogen of the acinous part destroys the insulin.

In the human being the proper dose of insulin, by hypodermic, causes in three hours even a 0.3 blood sugar to come to the normal or even down to 0.045 or 0.032 (*i.e.* hypoglycemia) and causes glycosuria and acetonuria to disappear. Then the blood sugar rises again and in eight hours may resume its previous reading.

Insulin is almost a specific in diabetic coma, if not given too late. Even when death results in spite of its administration, it causes the disappearance of sugar and acetone from the urine, and reduces the blood sugar to normal. It is capable of raising several fold, without hyperglycemia and glycosuria, the amount of protein, carbo-hydrate and fat which may be ingested by a diabetic. If given before each meal it enables the sugar to be oxidized and used, fixes glycogen in the liver, raises the carbohydrate tolerance and by regular use in this fashion, with an associated regulation of the diet, it produces, in diabetics, gain in strength and weight. In such cases during its use, the hyperglycemia, the glycosuria and the acetonuria disappear.

It is of a special importance in the diabetes of children.

Insulin does not act on the sugar directly; its presence supplies something which enables the body to fix glycogen in the liver and which permits of the oxidation and use of sugar by the tissues.

A marked *hypoglycemia* (insulin shock), from too large a dose of insulin, causes restlessness, uneasiness, a trembling sensation, sweating, convulsions and even coma. Such shock is relieved by the intravenous administration of glucose. It is better relieved by a hypodermic of 7 minims of adrenalin, followed by the oral administration of candy, orange juice or glucose.

The thyroid, the adrenal medulla, and the pituitary, probably posterior pituitary, are antagonistic to the pancreas. If the pancreas remains normal, with the thyroid, adrenals, and pituitary overactive, we may observe what are known as hyperthyroid symptoms. If, however, with an interglandular state of this sort, the islets are injured by an inflammation or a toxic condition or if, without these, the pancreas is sufficiently inhibited, this interglandular antagonism leads to diabetes. To repeat, if with such a sufficiently marked overactivity on the part of the thyroid, the adrenal medulla and probably the posterior pituitary the islets of Langerhans remain uninjured and perform their functions this interglandular antagonism may lead to any of the various degrees of hyperthyroidism. Hence the pancreas probably bears an intimate relation (1) to hyperthyroidism and Graves' disease, (2) as is now well recognized, to diabetes. The future possibilities, in a therapeutic way, the use of insulin and the other pancreatic extracts, are in the direction of correcting likewise interglandular relationships other than those resulting in diabetes and hyperthyroidism.

PINEAL

Our knowledge of pineal gland function is still very uncertain. Our knowledge of its function is suggested by the states associated with its pathology, *i.e.*, tumors.

Pineal teratoma in young boys is characterized by tallness, great growth of hair, premature sexual and genital development. Majority of opinion considers this to be due to hypopinealism. Pineal obesity has been found to be present with tumors of the pineal.

In cockerels, extirpation of pineal results in notable hypertrophy of the testes, body growth, and sexual precocity. No effect is observed in the female. This suggests that pineal inhibits a too early and too rapid sex development.

On the other hand, feeding pineal substance to chicks, dogs and guinea-pigs, leads to rapid body growth and to early sexual maturity. This stimulating effect occurs in males and females, but more markedly in males.

Pineal, therefore, appears to be related to processes of growth in the early years. It appears to have a secretory function, and it seems to contain sympathetic fibers and nerve fibers from the brain. The cells are neuroglia and secretory. It has been suggested that it controls the inflow and outflow of cerebro-spinal fluid of the third ventricle, and so helps to regulate intracranial pressure.

The pineal gland shows its chief functional activity in childhood; a significant involution of the structure occurs at puberty. During the period of complete development of the pineal gland —that is, until the seventh year—this organ normally exerts an inhibitory influence upon the development of the sex glands, and probably has a secondary effect on mental development.

Pineal enlargement, whether associated with hyperplasia or hypoplasia, may produce a tendency toward adiposity. Certain types of pineal tumor are characterized by extraordinary precocious puberty. According to Frankl-Hochwart, "When in a young individual (boy) there is increase in stature and unaccustomed growth of hair, obesity, drowsiness, a premature genital and sexual development, with evidence of precocity of adolescence, pineal tumor must be thought of."

Abnormal pineal function may cause male characteristics in the female, and in other cases may cause obesity; and in some cases it is possible that both phases may be blended.

PARATHYROID

Each parathyroid consists of closely packed polygonal cells divided by connective tissue septa into masses and cords. The glandules are surrounded by a capsule. Permeating the whole glandule is a delicate network of fine fibers differing from ordinary connective tissue (Vincent).

In close contact with each of the four parathyroids may be found a thymus nodule. Parathyroid cells may be found either in the cortex or medulla of the thymus. It has been

suggested that the parathyroid is concerned with anabolic processes closely related with the building up of nucleins.

There are two views as to the relation of the parathyroid to tetany; one, that tetany is the result of a deficiency of calcium; two, that tetany is due to a toxic agent. Among the toxic agents suggested is guanidine. Paton claims that injection of guanidine into animals produces all the symptoms of tetany. Dragstedt says "Parathyroid tetany or depression is due to an intoxication, the responsible toxic substances coming from the gastro-intestinal tract. They arise through the activity of the proteolytic group of intestinal bacteria, and are probably of the most part protein split products of the nature of amins. The function of the parathyroid glands is to prevent intoxication by these poisons."

McCarrison has used thymol as an intestinal antiseptic in tetany. Goiter is an important cause of tetany. This disease he finds to be seasonal, almost always occurring in the spring months.

An interesting point is the occurrence of tetany in the newly-born, which makes the relation of intestinal bacteria doubtful as a general etiological factor.

"The present position of the parathyroid glands in medicine may be briefly summarized. From the study of tetany, the regulation of calcium metabolism and the removal of guanidine derivatives from the system have been established as normal functions of these glands. The importance of the latter function is at present limited to tetany, but the regulation of calcium metabolism links up the parathyroid glands with every cell in the body. Among the normal functions of the somatic cells are the mechanisms of resistance to toxic agents, produced either by faulty metabolism or by infective processes; suggestions have been put forward to indicate how the parathyroid glands may be of assistance, through their influence on calcium metabolism, in overcoming the harmful action of such substances" (H. W. C. Vines).

THYMUS

Thymus originates as a bilateral entodermal structure from the third cleft, the two rudiments uniting in front of the trachea

into a single lobed body made up of several lobules separated by septa. The cortex is vascular and resembles in appearance a lymphatic gland. The medulla does not contain so many leucocytes as the cortex, but contains the concentric corpuscles of Hassall (Vincent).

The thymus has the character of an epithelial organ containing leucocytes from the mesoderm. These latter cells are considered by some to be thymic and epithelial. The thymus gland occupies a dominating position over the lymphatic apparatus. By some, this gland is classed with the lymphatic glands. It should be classed with the internal secretory glands of epithelial type.

The thymus grows up to the time of puberty and then slowly becomes smaller and recedes. This alone points toward the connection of the thymus with the genitalia. It fortifies the idea that normal involution of the thymus, being coincident with, may be due to the development of the sex glands. Either the thymus prevents a too-early development of the gonads, or the thymus fulfills a function taken over later on by the gonads; or else the gonadal development antagonizes the thymus.

The thymus may persist and function for years. Individuals with hypoplastic ovaries retain the thymus longer than normal. The thymus probably exerts an inhibitory influence upon the development of the ovaries, and involution of the thymus is consequent upon the maturity of the sex glands.

The thymus appears not to be essential to life in some animals. Removal of the thymus results in hypoplasia of the skeleton, a deficiency of undissolved calcium, and disturbances in the nervous system.

Status lymphaticus shows an enlarged thymus, associated adenoids, enlarged tonsils, and enlarged lymphatic glands.

Although the thymus slowly recedes after puberty, it functionates throughout life, as shown by its delicate response to varying bodily conditions and by the continued formation of lymph elements and Hassall's corpuscles. Increase or decrease in Hassall's corpuscles and in lymphatic tissues may occur independently, changes in the latter being usually a part of a general change of the body lymphatic tissues.

Acute infections are first associated with a marked increase in the lymphoid cells and a great increase in the number of Hassall's corpuscles.

Exophthalmic goiter is definitely accompanied by increase of both the thymic tissues and the same result follows the feeding of thyroid to animals. Whenever an increase or decrease of thymic lymphatic tissue appears, the same hold true for the purely lymphatic tissues and the lymphocyte count.

Hammar states that Hassall's corpuscles and lymphoid cells are controlled separately by excitor and depressor factors acting probably through the blood. Any true antigenic toxin, as diphtheria toxin, snake venom, or thyroid, when introduced into the body, leads to the formation of new Hassall's corpuscles. Hammar believes that the thymus is essentially concerned with the production of antibodies and that Hassal's corpuscles form the morphological expression of an anti-toxic activity. The increase of Hassall's corpuscles is especially marked in diphtheria.

The thymus produces "stimulins," which activate the phagocytic cells, increase the opsonins, and either produce complement or incite its production. The thymus protects against toxins.

Status thymicus (sudden death) is often associated with a large thymus, and formerly this sudden death was attributed to thymic asthma, but in sudden death in status lymphaticus there is no narrowing or closure of the trachea. The condition is really due to primary heart failure. In these cases there is a general enlargement of the lymph glands, of the tonsils, of the follicles at the base of the tongue, and in the intestines; enlargement of the spleen, large thymus, narrow aorta, large, soft, pale heart. These patients stand narcosis poorly and have a deficient development of the "chromaffin" system. It becomes easily tired, does this important system, at least in cases of sudden death. Death occurs by sudden exitus in individuals who have the not infrequent combination of Basedow's disease and status thymicus. Individuals with a lymphatic-chlorotic constitution show a remarkably slight resistance towards infectious diseases.

Most probably an important function consists in removing injurious substances from the blood. Failure of function may result in disturbances in the calcium metabolism, changes in bone, and in the central nervous system.

Between the thymus, on the one hand, and the other organs of internal secretion, on the other, complex relations probably exist. Castration in animals causes enlargement of the thymus. Thymus feeding causes hypertrophy of its cortex. There seems to be a close relationship between the thymus and the thyroid, judged by the frequency with which the thymus is enlarged in Basedow's disease. Hart, among others, thinks that Basedow's is due rather to hyperthymisation than to hyperthyroidism. It is possible that the thymus is antagonistic to the adrenals.

THE ADRENAL BODIES

What we call the adrenal body represents the anatomic association of two elements, each one of which is derived from a separate and independent system. The adrenal body proper or cortex is part of the "cortical" or "inter-renal" system. The medulla is simply an accumulation of chromaphil cells of the same nature, histologically, chemically, and pharmacodynamically, as similar but smaller masses along the sympathetic at other levels (Vincent).

There is no clear evidence that these two systems are functionally related to one another.

The *adrenal medulla* (as well as the "chromaphil tissue" generally) is derived from the sympathetic nervous system, and is alleged to facilitate this system's functions in certain physiological emergencies (page 172).

The *cortex* is derived from the germinal epithelium and there is considerable evidence that it has important functions in connection with the development of the reproductive organs.

There is a considerable mass of clinical evidence that tumors of the adrenal cortex are frequently associated with sex abnormalities.

The association is frequent, though not constant.

Additional evidence in the same direction is furnished by the enlargement of the cortex during breeding and pregnancy.

It is possible that a final solution of the problem as to the relation between the adrenal gland and sex will only be arrived at when the wider problem of the relationships between the various ductless glands shall have been solved.

Feeding young animals with adrenal gland substance seems to stimulate the growth of the testes.

Inanition produces marked hypertrophy of the adrenal bodies (McCarrison, Vincent and Hollenberg).

The cortex is the part of the gland which is essential to life. We do not know why its removal causes death, but it is possible that this is due to some defect in muscular metabolism (Swale Vincent).

Attention was attracted to the adrenal bodies by Addison's disease. Among its important symptoms are pigmentation, which may not always occur which consists of a diffused discoloration or of pigmented spots and dark patches or streaks appearing on normally pigmented areas or in areas where there is pressure by belt, corset, garter, collar button, etc. Asthenia is a marked symptom. The blood pressure is low; vomiting is common; there may be insomnia, vertigo, noises in the ears, etc.

In some cases of Addison's disease, it is said that the adrenals are normal. Some cases which show destruction of the adrenals evidence no clinical sign. The question is, whether the disease is due to primary destruction of the medulla only, or of the cortex or both. Marine says the cortex. It is supposed that there is a deficiency in the functional activity of the adrenal bodies, or a disease of the sympathetic nerves and ganglia. Whatever we know of Addison's disease, is explained with difficulty by anything that we know about the functions of the adrenal bodies.

Of the functions of the adrenal bodies, the following are mentioned:

1. To neutralize some of the poisonous products of metabolism.

2. To maintain the tone of muscular structures or neutralize products of muscular activity.

3. To produce pigment which raises the power of resistance of tissues and organs, and protects underlying struc-

tures from certain rays. It is not known what part the cortex or medulla play in pigmentation. The pigment of Addison's disease belongs to the class of melanins and does not contain iron.

Adrenal Medulla.—The medulla comes from the same derm as the peripheral part of the sympathetic, and the sympathetic ganglia, that is the neural ectoderm. (Thus the adrenals are derived from two separate and distinct kinds of tissue.)

Chromaphil bodies are to be found wherever sympathetic nerves extend, especially in connection with the abdominal sympathetic, near the origin of the inferior mesenteric artery. They are found as cell groups. The medulla of the adrenals, and the chromaphil bodies are composed of the same character of chromaphil cells.

Subcutaneous injection of adrenalin produces a temporary hyperglycemia and glycosuria. After prolonged administration of adrenalin, the islets of Langerhans hypertrophy. Adrenalin glycosuria seems to be related to thyroid and sympathetic functions. It has been suggested that the lymph contains a chemical substance from the islets of Langerhans essential to normal carbohydrate metabolism.

Adrenalin when injected contracts arterioles, increases the tone of the heart and arteries, and acts especially on the splanchnic area and on the sympathetic nerve ends; on the uterus, skin arteries, on all medium-sized arteries, on the main branches of the cœliac and superior mesenteric arteries. On the other hand, very small doses of adrenalin cause a fall in pressure.

While adrenalin acts on unstriated muscles and on gland cells, it acts on structures innervated by the sympathetic. There seems to be an antagonism between adrenalin and calcium chloride. Adrenin increases the tone of cardiac and vascular muscles, acts on the neuro-muscular functions, and disappears by a process of oxidation.

Though adrenalin produces certain effects when injected, it is considered by some that there is no proof that this substance is being introduced into the living body. From the structure of the medulla it is claimed that it is not a secretory gland.

Continuous secretion of adrenalin into the circulation is not to be regarded as a factor in maintaining normal blood pressure.

Hoskins says that there is no reliable evidence that under normal conditions circulating blood contains any adrenalin at all. The medulla is not essential to life. There is more chromaphil tissues outside of the adrenal bodies than in them. These are found in the sympathetic ganglia and in masses in the abdomen.

During emotional stress, adrenal bodies pour into the circulation adrenin to be of service, possibly by increasing the power of sustained muscular activity. The tonus theory of adrenal action is not supported by laboratory experiments (Vincent).

Adrenal Cortex.—The cortex comes from the mesoderm in the region of the primitive kidney. Accessory adrenals consisting of cortex are found near the adrenals and in the retroperitoneal space, in the genital region, in the lig. latum, or between the testis and epididymis. The cells of the cortex resemble the interstitial cells of the testis and ovaries. Different organs contain different lipoids characteristic for each organ. The cortex contains lipoid substances and is very rich in lipoids. The cortex is the part essential to life. A certain role is played by the accessory cortical bodies. In grafting experiments the cortex is the only part which takes, the chromaphil cells being said to be incapable of hyperplasia (Vincent).

The cortex produces, so far as is known, lecithin and pigment. Its internal secretion is viewed as a lecithalbumin. Among the theories as to the function of the cortex, we have:

1. It is related to the growth and development of the sex organs especially.
2. It has an anti-toxin function.
3. It plays a part in the elaboration of adrenin.
4. It is associated in the development of the brain, *i.e.*, the lecithin product of the cortex is related to the lecithin requirements of the brain.

There is a resemblance between the cells of the cortex and the interstitial cells of ovary, testis and cells of the corpus luteum.

Active adrenals are apparently necessary to the normal growth and development of the brain.

Diphtheria, scarlet, typhoid, erysipelas, chloroform poisoning are especially prone to injure the adrenals. The French school

claims that the combination of muscular weakness, low blood pressure, digestive and nervous troubles, are due to adrenal insufficiency, and the same claim is made as to shell shock. The same school claims that adrenal hyperplasia is found to be generally present in chronic interstitial nephritis. On the other hand, Mott says that advanced arterial sclerosis evidences a medulla more often atrophied than hypertrophied.

Hyperplasia of the adrenals tends to be associated with the appearance of male characteristics in the female. Adrenal hypernephromata in children are more common in females and tend to increase the male primary and secondary sex characteristics at the expense of the female (Vincent).

Gallais regards the cortex as a puberty gland. Hypernephromata produce two types of individual;

1. Obese, with pigmented skin, growth of pelvic hair, a low average of intellect.

2. The muscular type, occurring only in males who may show sexual precocity.

Marine and Bauman consider that the asthenia and fatal outcome of Addison's disease are referable to the cortex.

"Many long known and well established facts clearly indicate an important relation of the cortex to the sex glands and to the thyroid. The suprarenals enlarged during pregnancy and after removal of the sex glands. The cortex, the corpus luteum and the interstitial cells are grouped together as regards certain of their functions, forming a gonadal system which might be called 'parasex'" (Marine).

As regards the relation of the cortex to the thyroid, Marine finds that removing the suprarenals or freezing the cortex results in increased heat production in the body, due in part to relatively increased thyroid activity, brought about by removal of the inhibitory influence normally exerted on the thyroid by the adrenal cortex. In other words, there is an antagonism between the thyroid and the cortex.

Removal of corpus luteum early in pregnancy leads to abortion.

Removal of suprarenals in pregnant rabbits in the latter half of pregnancy leads to abortion.

"The immediate cause of thyroid hypertrophy in goiter is a deficiency in the iodin store of the thyroid. Anything that causes a sufficient reduction in its iodin store will cause the thyroid to hypertrophy, whether it be infection, decided reduction of intake, or increased demands for iodin. The essential physiological disturbance in the thyroid in exophthalmic goiter, is a relative insufficiency, its reaction compensatory, and its significance symptomatic" (Marine).

"The clinical manifestation of many acute cases of exophthalmic goiter are almost identical with the clinical manifestations produced in rabbits by sufficient repression of the cortical functions. This conception would explain the continued lymphoid and thyroid stimulation as in part dependent upon a weakness or exhaustion of the cortical functions.

Cortical and interstitial gland insufficiency will not fully explain exophthalmic goiter. This is, however, one of the essential reactions from which many of the disturbed interrelations directly or indirectly arise.

If the cortex can accelerate and inhibit thyroid activity, one must suppose that it is inter-related with many other gland activities in a similar manner and there is abundant evidence that this is the case."

These observations of Marine and Bauman support the contention that overactivity of the adrenal medulla (insufficiency of the cortex, loss of balance) is an essential feature of many cases of hyperthyroidism, toxic adenoma, and exophthalmic goiter. It, indeed, further supports the idea that the primary causative factor in many cases may be the adrenal medulla and that the thyroid changes may, at least in part, be a reaction to this phase.

THYROID

The thyroid arises from the ventral walls of the pharynx. Its lobes are divided into lobules, composed of closed vesicles separated from each other by connective tissue and inter-vesicular cellular tissue, and often by solid cords and nests of epithelial cells resembling, closely, parathyroid tissue. There is often as much of this inter-vesicular tissue as there is vesicular. The epithelium of the vesicles are Hauptzellen and colloid cells.

The contents are yellow, sticky, and vary, from the granular mass with cell debris of the embryo, to the occasional vesicles filled with transparent colloid, up to the colloid substance filling the vesicles completely, of the adult.

The colloid is a concentrated form of the original fluid of the vesicles. It is a product of the epithelial cells and varies according to the functional activities, and consists of protein mainly.

Two definite compounds containing iodin have been separated from thyroid tissue; one, a globulin, spelled iodo-thyroglobulin, existing as such in the gland; two, thyroxin, a cleavage product (a derivative of tryptophane), a definite crystalline iodin compound, containing 65 per cent. iodin.

Thyroxin is an iodin compound of indol which is a decomposition product of tryptophan. Indol is split off by the intestinal bacteria, especially the bacillus coli. Hence, infants fail to make their own thyroid product, for the lack of bacilli coli interferes with the elaboration of this important hormone. From milk, especially mother's milk (with normal thyroid) infants obtain their thyroid products.

Thyroxin probably is a catalyst and daily administration of large doses may cause serious disturbances and even death. But one dose, even larger, is not injurious. It increases the metabolic rate.

Marine plants and all marine animals contain iodin. In vertebrates this is found practically entirely in the thyroid. The relative amount of thyroid tissue increases as we ascend the scale of evolution, but the iodin content does not increase correspondingly.

There is a physiological, seasonal and age variation, as to limits, in the work of the thyroid. The highest iodin content of the thyroid is found between forty and sixty years, and least below fifteen years. Seasonal variations in the iodin content of the thyroid occur in the sheep, pig, and ox. Between December and May the amount is one-third that found between June and November.

There is two to three times as much iodin in the thyroid gland of cattle, hogs, and sheep between June and November as during the months between December and May. Seasonal variations, of temperature may effect to a marked degree the

activity of the thyroid gland. As the thyroid and gonads exhibit waves of seasonal activity, so growth and metabolism also manifest seasonal waves. Children gain four times as much between September and January as they do from February to June. Practically all the growth occurs in the autumn.

Diet is also an important factor in causing variations in the iodin content of the thyroid. The thyroids of carnivora have less iodin than herbivora. The thyroid iodin is obtained especially from fish, mollusks, milk, eggs, wine and water. The iodin is stored and contained chiefly in the colloid substance. Practically all of it is in organic combinations.

The administration of iodin causes active thyroid hyperplasia of all animals to revert to the colloid state; prevents the occurrence of active hyperplasia following partial removal of gland. Otherwise, the remaining tissue would undergo hyperplasia.

Normal thyroids of all the animals examined have the highest and marked hyperplasia, the lowest iodin contents.

The administration of iodin-containing compounds to animals in any form and by any method is rapidly followed by its storage in the thyroid in quantities that bear no relation to the iodin content of the other tissues (Marine).

It has been shown (Marine and Williams, Marine and Lenhart) that in dog, sheep, pig, ox, and human thyroids there is a quite constant minimum percentage of iodin necessary for the maintenance of normal gland structure.

"While practically nothing is known of the causes leading to the iodin deficiency in the animal, facts, beyond doubt, show that the increased growth and divisional activity of the thyroid cells are intimately associated with a decrease in iodin, and that the increased iodin content is similarly associated with a decreased growth and divisional activity of the thyroid cells. On this basis, one would expect to find thyroid changes resulting from any cause which diminished the intake or assimilation of, or increased the body demands for, iodin and that, therefore, all thyroid changes would be compensatory in nature and secondary to more fundamental causes, perhaps nutritional in nature."

The thyroid probably bears a like regulatory relation to the iodin content of the blood that the pancreas (insulin) bears to the liver and the glycogen content of the blood.

Not all the value of the thyroid, however, is associated with its iodin content. There are secretory substances of other kinds.

Thyroid accelerates metamorphosis.

Thyroid feeding in tadpoles inhibits growth and causes precocious differentiation. Tissues grown in vitro increase several times as rapidly in the presence of thyroid substance. Thyroid feeding in white rats decreases the rate of growth and causes a disappearance of fat, and a hypertrophy of the organs concerned with increased metabolism (heart, liver, kidney, adrenals). These changes are due to the thyroid substance or some constituent of thyroid and do not occur on the administration of sodium iodid.

All endocrines are related to growth, especially thyroid (morphological differentiation), anterior pituitary, the gonads, and adrenal cortex. These glands, as well as others, are, in addition, normally activated, stimulated or held in bounds by a normally functioning thyroid.

The metabolic rate is much more rapid in the child than in the adult, and as middle life slips on toward senility, the rate gradually falls. Thyroid excess increases the activity of cells. There is, then, an excessive decomposition of proteids, there is an excess of oxidation, there is an abnormal excretion, in excess, of calcium, phosphorus and nitrogen. With deficiency of thyroid on the other hand, the cells accumulate waste material and the other ductless glands are likewise so influenced.

Because of lack of thyroid, processes of metamorphosis, differentiation and ripening fail, as is observed in Infantile Hypothyroidism; (1) adiposity; (2) delayed dentition; (3) delayed talking; (4) delayed walking; (5) umbilical hernia; (6) undescended testicles; (7) backward mentality; (8) tonsils, adenoids; (9) some cases of nocturnal eneuresis; (10) constipation; (11) tendencies to skin irritations, etc.

The degrees of *hypothyroidism* vary from a slight diminution of thyroid, seasonal, paroxysmal or continuous, to varying degrees of myxedema, to cretinism, and actual or almost congenital absence of the thyroid.

In the more severe degrees it is readily seen that the entire interglandular system is more or less abnormal. Of these

cases, as well as in the thyroid atrophy, which may develop in the fifth and sixth years, the large majority are females. Lack of thyroid in the mother, during pregnancy, is said to be the cause of Cretinism. Lack of thyroid in Mother's milk, or other milk, is a frequent cause of thyroid deprivation. It is quite certain that thyroid anomalies are transmissible, the severity of annoyance in children bearing no definite relation, as to severity or type, to the severity or type in the mother.

Thyroid increases protein metabolism. The statement has been made that "certain amines derived from proteins have an effect on the metabolism of the same character as that brought about by thyroid substance."

Thyroid gland, then, provides substances which aid in development, growth, morphological differentiation, and which regulate metabolic processes of the body. One of the substances is an iodized amine, thyroxin. Most of its activities are catabolic, although according to some authorities there are indications of the existence of an anabolic substance. The effect of small doses of thyroid is of great interest, for in very many cases, it leads to a gain in weight.

Colloid formation is possibly a means of storage of materials needed in thyroid metabolism. Hypertrophy and hyperplasia occupy a prominent place in such necessary changes. Thus the thyroid, due to additional requirements of the growing embryo, shows a normal increase in size during pregnancy. Conversely, during inanition, it has been experimentally shown to decrease in size as well as to increase in size on meat ingestion. It is very likely, on account of these and other demands, that hyperplasia is frequently required in the case of the thyroid during the normal course of existence.

Even if thyroxin speeds up metabolism, yet the ultimate purpose and function of the whole thyroid, through cellular and glandular stimulation, is anabolic.

Growth puts an added strain on thyroxin production, since the chief function of the thyroid is anabolic (Janney). All evidence goes to show that the thyroid is under very delicate sympathetic nervous control, in turn influenced by central and

very probably by hormonic stimuli adrenalin (Cannon, Lenhart, and Bowmann). Anatomically and physiologically, thyroid activity is also stimulated by increased iodin content of the blood, for which element, because of this gland's specific need for iodin, it exerts a selective affinity.

Cannon says that "when we come to the remarkable sequence of events which leads to maturity—the prepubertal increase in height, the development of secondary sexual characteristics, the increase of bodily vigor, the appearance of reproductive elements, remarkable transformation related to changes in the interstitial tissue of the testis, in the thyroid, in the adrenal cortex, and in the pituitary body, as well as gradual disappearance of the thymus—we are confronted with a complex of interrelations altogether too involved to be untangled at present. We must rest on the faith that this wonderfully ordered process, starting on schedule time in the life history after thirteen or fourteen years of quiescence, is automatically arranged to run its course. Some time we shall know, I believe, the successive stages, and be able to *help them onward when they are checked.*"

Thyroid plays an important rôle, with the other endocrines, at puberty.

At the puberty period, thyroid is a *sex gland*, and failure of its proper trophic function may result in late menstruation, small uterus, small ovaries, chlorosis, obesity, dysmenorrhea, relative amenorrhea. Later, a proper trophic relation to the genitalia is essential to fecundation. A normally acting thyroid is essential to well-being in pregnancy, to the avoidance of the toxemias of pregnancy, and to normal function on the part of the kidneys.

"This emergency ration (thyroid storage) is drawn upon at puberty, marriage, and pregnancy, while the gland shows retrogressive changes at the climacteric. The close functional association between the thyroid gland and reproduction has long been known, and makes specially interesting Gaskell's observation on the even closer structural association between the thyroid and the uterus of the vertebrate ancestor. McCarrison has also

laid special stress on the demand made on the thyroid by infections and intoxications, while Crile has emphasized the influence of the emotions in the same direction" (Langdon Brown).

HYPERTHYROIDISM OF ADOLESCENCE

Hyperthyroidism during adolescence is of frequent occurrence often without any sign of enlargement of the thryoid. These patients have tachycardia, fatigue, loss of "pep," moist hands, white skin. Even though mentally active and bright at school, and having the desire to do, they lack the requisite strength. Their skins do not tan readily or well when exposed to sunlight in out door summer sports. Whether this complex be due to a lack of iodin in the food and water, or to a failure of absorption through some intestinal dysfunction, or whether there is too much iodin in the blood through failure of the thyroid to hold it, or whether the thyroid, due to physical, developmental and emotional causes, is overacting, the symptoms are the same as those produced by too large doses of thyroid given over a long period of time. It is apparent to me, that the adrenal medulla is overacting in these cases, as we may readily grant, considering the physical and interglandular changes and the emotional reactions associated with the adolescent period of life. It would seem quite plausible to consider that a part of the pathology of this state is represented by a reaction of the thyroid to this oversecretion of the adrenal medulla. Oversecretion of the adrenal medulla implies an underactivity of the adrenal cortex.

My own experience and recent investigations justify the belief that insufficiency of adrenal cortex plays an important part in hyperthyroidism. Certainly, the differences between the male and female, before the adolescent stage, are not so marked physically as at the later period when the action of the cells of Leydig, the adrenal cortex, and the anterior pituitary make the male physical characteristics quite apparent. But even at this early developmental period, menstruation with its months of preliminary preparation makes it evident that the endocrine and associated chemical factors are against the

female as compared with the male. The female is without that added support by anterior pituitary, adrenal cortex, and cells of Leydig, which adds so much to the virility of the male sex. The relative and actual lack of these very glands in the female tends to enhance emotional instability and sensitiveness to emotional reaction.

Simple or colloid goiter of adolescence may have precisely the same set of symptoms, but it would be unwise to overlook the large number of hyperthyroid adolescents who have no sign of enlarged gland. But, because the goiter calls attention to an endocrine abnormality, we prefer to speak, in this chapter, of the hyperthyroidism of adolescence as well as the goiter of adolescence. The more severe degrees of hyperthyroidism up to toxic adenoma and Graves' disease are all purely interglandular states. At this period of adolescence we are dealing likewise with a pluriglandular state. Important as is the thyroid to proper sex development, it acts not only by virtue of its own trophic action, but by virtue of the fact that it stimulates the other glands concerned in this function. Genital aplasia, hypoplasia, or dysfunction may be due to the pituitary, to the thymus, to the adrenals, or to the ovaries. From each of these glands, comes a trophic stimulus, and a proper interglandular cooperation is necessary. The hyperthyroidism of adolescence may overstimulate some of these glands or may over inhibit them and no observation is of any value which fails to take into consideration at this period a thorough study and review of each endocrine gland of the body.

Goiter of Adolescence.—Goiter without symptoms of hyperthyroidism includes colloid goiter, adenoma, and degenerative forms.

Goiter with hyperthyroidism includes the goiter of adolescence, adenoma, and Graves disease.

The goiter of adolescence has an increased colloid content after a preliminary stage of decreased colloid. The thyroid stores iodin as the liver stores glycogen. Due to a deficient amount of iodin intake or absorption, or due to increased physiological demands of the adolescent or to the complex interglandular adjustments, thyroid enlargement may be a com-

pensatory process. The thyroid is a sex gland at this period particularly. Its relationship to the uterus and the ovaries, provides a different interglandular cycle than in the male with testes and cells of Leydig. The female sex characteristics are so different from those of the male (breasts, pelvis, skin padding, absence of hair on the face and body, etc.). Obviously such an interglandular relationship as exists in the female makes the thyroid sensitive to whatever may be the causes of hypo- and hyperthyroidism, for thyroid gland troubles are eight to ten times as frequent in the female as in the male.

In these adolescent goiters there may be, with hyperthyroidism, fatigue, poor color, moist hands, loss of weight, tachycardia, nervousness, dysmenorrhea, relative amenorrhea, etc. Many of these cases require a differential diagnosis from localized or early cases of tuberculosis. In many of the patients this hyperthyroid condition is not a continuous one but comes on at irregular intervals or in what might be called paroxysms. The readiness with which the thyroid is influenced by psychic and nerve influences, makes it peculiarly susceptible to such exciting factors.

The basal metabolism test in these cases is often of uncertain aid. The deviation from the normal may be very slight or too slight to be considered accurate. Over-activity of the thyroid is in many cases made evident by what might be called psychic phenomena, and though particularly the pulse rate, affecting the basal metabolism may not be permanently altered.

The goiter of adolescence is generally a self-limiting condition, often cured spontaneously and now generally treated with very small doses of sodium iodid. If, after treatment, the colloid disappears and the gland is still enlarged, we are confronted with the probable presence of adenoma. It is important to treat and correct adolescent congestive or colloid goiter because, in the interglandular relationship of the female, the thyroid is intimately concerned with development, menstruation, fecundation, pregnancy, and in pregnancy, with the function of the kidneys and the prevention of toxemias. The irritability in these young patients may be due in part to the

excessive loss of calcium which takes place in hyperthyroidism and calcium should be administered.

Treatment of Hyperthyroidism and Goiter of Adolescence.—The adrenal medulla, the liver and the thyroid gland can be stimulated to extra activity by sympatheticus impulses, especially by pain and by emotional excitement. Among the endocrine structures likewise having a nerve supply to their cells, are the anterior lobe of the pituitary, the cells of the parathyroids, the cells of the islets of Langerhans. It is said that vagus stimulation induces a drop in blood sugar through action on the islets on Langerhans. Innervation of an endocrine gland suggests demands of special service in time of need. Cannon intimates that some glands exhibit chemogenic secretions, other neurogenic and others, both. Hence the value of rest and freedom from any excitement in the treatment of hyperthyroidism.

There is, in hyperthyroidism of the various degrees, a decided imbalance, (more or less) autonomic; the important clinical features being apparent in the involuntary nervous system.

Small doses of nicotin increase secretion from the adrenal medulla. Strychnine and physostigmine do so likewise. It is said that they affect the liver and the thyroid through sympathetic impulses. Morphin and quinin appear to decrease the activity of the thyroid.

Thyroid hyperplasia may be produced by high protein diet. Protein feeding seems to make a demand on the thyroid that is equivalent to depriving the gland of necessary iodin. A diet deficient in vitamins causes enlargement of the adrenal glands and, in the male of the pituitary also.

In hyperthyroidism there is a functional insufficiency of the adrenal cortex. The chemical function of adrenin resembles that of one of the amino acids, tyrosin.

The colloid in the vesicles may be looked upon as containing a reserve of iodin for the body. In the active stage there is little colloid, and the cells are cuboidal, or even columnar. The resting stage can be produced by giving iodin or iodin-containing foods.

In addition to five grains of sodium iodid given at night, in addition to a diet rich in vitamins, and including cod-liver oil, one may administer:

1. Luminal gr. ¼, plus calcium glycerino-phosphate gr. v plus quinin hydro-bromid gr. v t. i. d. Luminal, plus ovarian residue gr. v with iron and arsenic, is given in the cases evidencing amenorrhea.

2. Luminal gr. ¼, plus calcium glycerino-phosphate or quinin hydro-bromid gr. v, plus anterior pituitary g. v in cases suffering from excessive menstruation.

3. Luminal gr. ¼, plus calcium-glycerino-phosphate, g. v plus adrenal cortex gr. iii (or adrenal nucleo-protein gr. iii) in cases with marked asthenia.

Rest is of the greatest value. Sunlight, tanning of the skin, are important aids in many cases.

Hyperthyroidism, Adenoma and Graves' Disease (Thyrotoxicosis).—Symptoms and signs of Graves' disease are the result of an abnormal metabolism of the thyroid gland, *i.e.*, a dysfunctional condition.

Thyrotoxicosis is liable to occur in families showing a tendency to goiter and hypothyroidism. In individuals of the same family, certain members may exhibit thyrotoxicosis, others hypothyroidism. The familial occurrence would bespeak a common origin and etiologic relationship of the two clinical conditions.

Adenomatous goiters may be properly regarded as caused by toxic or other agents inducing primary cellular injury or exhaustion followed by secondary hyperplasia.

Of 1402 thyrotoxic cases recently reported by Boothby, 366 developed thyroadenomata after periods averaging sixteen years after appearance of the goiter. If we agree with Marine and Lenhart's well substantiated arguments on the compensatory nature of all thyroid hyperplasias, then we must agree that all toxic thyroadenomata develop in glands showing previously cellular proliferation due to toxic or other injury, therefore in a potential hypofunctional condition (Janney).

The symptoms of Graves' disease are known to appear as a sequella to acute thyroiditis following trauma or by extension from neighboring foci; also after typhoid fever, tuberculosis and

other bacterial infections. Chronic intestinal toxemia is probably an etiologic factor in another group of cases. It may be noted that these same etiologic factors are frequently demonstrable in simple and endemic goiter (McCarrison *Waterborn Idea*).

From these considerations, it is evident that hyperplasia in thyroid conditions, develops on account of the same causes as in all other organs and tissues, and is due to:

1. Increased physiological requirements (examples, goiter of puberty, pregnancy, etc.).

2. Decreased function because of trauma, infection and other pathological processes either in the thyroid or in the organism in general (examples, acute thyroiditis with acinous hyperplasia, thyroid enlargement in acute and chronic infectious diseases, endemic goiter, hyperplasia after thyroidectomy).

3. Decreased function due to under-nutrition, including iodin starvation (examples, goiters in poorly fed puppies, lambs, and children).

The hyperplasia of thyrotoxicosis is best explained, just as in other thyroid hypertrophies, as an attempt at compensatory regeneration to make up for cellular exhaustion and injury due to toxic or other cause. We have thus an acceptable explanation for the thyroid hyperplasia of Graves' disease arising from local or focal infections. Intestinal toxemia and bacterial infections, hyperplasias not susceptible of reasonable explanation by the hyperthyroid theory. In order that the supply of thyroxin under these circumstances be maintained at the normal level, increase in the secretory tissue is necessary in order to compensate for exhaustion of the acinous cells through toxemia (Janney).

The pathological processes, then, are essentially the same in all thyroid diseases, aside from the malignant.

They represent themselves by three stages: (1) The hyperplastic; (2) the involuntary, recovery or colloid; (3) the exhaustion or premature atrophy or myxedematous stage (Marine and Lenhart, McCarrison).

It is significant that myxedema never precedes thyrotoxicosis, but often follows it.

Often cases present in no uncertain way a combination of thyrotoxic and hypothyroid symptoms. Thus a combination of tremor, sudorrhea and at times exophthalmos and tachycardia may be present in patients showing the hypothyroid type of obesity, mental hebetude and asthenia.

In thyrotoxic cases arising after nervous shock or exhaustion, hyperplasia is again explicable on the same general basis. Owing to exaggerated or deficient neuro-trophic stimuli in such cases, an abnormal cellular metabolism is set up with ensuing decrease in the normal quotum of normally functioning parenchyma, which condition elicits the stimulus to rapid hyperplasia. According to our hypothesis there is present in the thyroid and the blood of exophthalmic goiter patients a toxic substance. This view is substantiated by the experiments of Caro, confirmed by Klose, by demonstrating the toxity of the urine from exophthalmic goiter patients; also recently by Blackford and Banford, who found a depressor substance in the thyroid and serums of such patients (Janney).

In view of the intestinal disturbances so common in Graves' disease it is a suggestive fact that indole is a putrefactive decomposition product of the tryptophane in the protein molecule.

"In my experience tonsillar sepsis is a potent factor in thyroid enlargement. McCarrison has called attention to the part played by intestinal toxemia in this direction, and has succeeded in inducing such enlargement by fæcal flora. His conclusions as to the genesis and course of thyroid enlargement (apart from neoplasms) are as follows:"

1. They are all due to psychic, nutritional or toxic factors, acting singly, or more commonly in combination.

2. In all, the pathological process is essentially the same; greater or less degrees of hyperplasia, followed by greater or less degrees of fibrosis and atrophy.

3. In all, there is an alteration in the quantity and quality of the thyroid secretion poured into the blood stream (McCarrison).

In exophthalmic goiter we have the continued action of some excitant which admits of no period of rest, so that the gland is soon emptied of its colloid reserves, while the secreting struc-

tures undergo compensatory hypertrophy. The heightened excitability of the sympathetic nervous system is shown in the exophthalmos, the rapid pulse, the sweating and the diminished secretion of gastric juice. As with adrenal stimulation, we find raised blood sugar, a tendency to glycosuria and to pigmentation of the skin. The stimulation of the whole of the emotional apparatus is so obvious that the aspect has been well compared to a state of continuous fear, as seen in the staring eyes, the downward curve of the mouth, and the tremors.

As McCarrison says, the ideal conditions for the development of exophthalmic goiter are provided when all, or at any rate more than one, or the three factors, nutritional, psychic, and infectious, are at work, and Crile observes; "I have never known a case of Graves' disease to be caused by success or happiness alone, or by hard physical labor unattended by psychic strain, or to be the result of energy voluntarily discharged."

"In my opinion a psychic factor of matrimonial origin is specially liable to induce the condition. The excitability of the nervous system in the subjects of Graves' disease is further shown by the liability of diabetes, neuroses and psychoses to occur in the family" (Langdon Brown).

This emergency ration (thyroid reserve) is drawn upon at puberty, marriage, and pregnancy, while the gland shows retrogressive changes at the climacteric. The close functional association between the thyroid gland and reproduction has long been known, and makes specially interesting Gaskell's observation on the even closer structural association between the thyroid and the uterus of the vertebrate ancestor. McCarrison has also laid special stress on the demand made on the thyroid by infections and intoxications, while Crile has emphasized the emotions in the same direction.

The test of Goetsch, designed to reveal hyperthyroid activity, is criticized because it is positive in cases which do not have other indications of extra-thyroid function. There is no question of the phenomena observed by Goetsch, but theoretically they may be due, not only to hyperthyroidism, but also to excessive activity of the sympathetic system and to increased secretion of adrenin into the blood (Cannon).

The opinion has been expressed that in all cases of Graves' disease the adrenals are also involved, but even without that assumption such manifestations can be explained as due to the continuance of sympathetic stimulation when the thyroid is approaching exhaustion, or acquiring a higher threshold of response.

A diffuse adenohyperplasia is regularly found in Graves' disease (Kocher, F. v. Muller). This may include the tonsils, spleen and intestinal follicles. The lymphoid cell infiltration of the thyroid itself is best considered an expression of the same general process. It is probable that the thymic enlargement, in spite of efforts to bring out a more specific relationship, is but an instance of the general status thymolymphaticus present.

Profound chemical disturbances in Graves' disease is further evidenced by the changes in other ductless glands—alterations in thyrotoxicosis; the presence of symptoms and lesions of hypofunctional type referable to the pituitary (polyuria, polydipsia, fat distribution); thymus (hypertrophy); suprarenals (cutaneous pigmentation, asthenia, diarrhœa); pancreas (alimentary glycosuria, diabetes); lymphatic system (lymphatic hypertrophy, splenomegaly, enlarged tonsils and adenoids); gonads (hypoplasia, decreased libido, dysmenorrhœa, amenorrhœa, menorrhagia).

Thyroid Symptoms.—The arrest of growth in *removal* of the thyroid in animals is due to a retardation of the process of ossification, both of the epiphyses and of the synchondroses. In the internal organs there results an enlargement of the glandular portion of the hypophysis. In addition to the difference in skeletal growth, there is general apathy and atheromatous degeneration of the aorta. There is infantilism, imperfect activity of the sexual glands, and general torpor. The animals weigh one-third as much only as they should. The arrest in the growth of the skeleton and the development of the sexual organs is the typical and invariable result of the absence of the thyroid function in carnivoræ and herbivoræ. In older animals the changes are less marked, removal causing loss of appetite, sluggish digestion, increased emaciation, and

finally cachexia thyreopriva. There are apathy, trophic disturbances of the cuticle, falling of the hair, dryness of the skin, and eczema. The number of red blood-cells and the hemoglobin are decreased, but there is an increasing leukocytosis. The typical and invariable result of the suppression of the thyroid function in adult animals is a progressive emaciation, which increases to profound cachexia and culminates in death. The most characteristic post-mortem finding is the enlargement of the hypophysis (Biedl).

The same changes occur in human beings after removal of the entire thyroid. This is the so-called *cachexia-strumipriva*. A further symptom of this cachexia is a diminution of the mental energy, of the energy for work, and a typical edematous swelling of the skin.

Lack of secretion of the thyroid in infancy produces failure of growth and development, both mental and physical. The thyroid is a necessary element in promoting growth in childhood and in controlling the development of the body and mind. It rouses mental activity and is a cerebral stimulant. It aids nitrogen metabolism. It is essential in its relation to other secretions in providing genital development.

In *congenital myxedema* there is a decided inhibition of growth. There are obstipation, psychic disturbances, and a marked inhibiting effect on the sexual organs. In congenital absence of the thyroid and in the infantile cases of atrophy of the thyroid, which atrophy develops in the fifth and sixth years, the large majority of the cases are found in female children.

In *cretinism* the genitalia remain of the infantile type. The secondary sex characteristics, such as the breasts and the hairing of the mons veneris, are very slightly developed. Myxedema in adults is more frequent than infantile myxedema. Myxedema, cretinism, cachexia strumipriva are all allied conditions.

The thyroid gland is very active at puberty, and begins to regress at the so-called climacteric period. In old age the thyroid becomes atrophic. The falling of the hair, the dropping of the teeth, and dry and wrinkled skin, the lowered temperature, diminished perspiration, retarded digestion, and

consequent emaciation, reduced metabolic rate, and consequent deposit of fat, followed by emaciation, decrease of mental power, and the diminution of the activity of the entire nervous system, are all symptoms which characterize *chronic myxedema* (a pluri-glandular syndrome).

Too little thyroid is responsible for some cases of slow growth in children, for eczema, some cases of asthma, perhaps amenorrhea, disturbances of digestion, states of depression and of melancholia, myxedema, etc., also for the dry eczema and itching of the menopause and of old age.

A frequent type of hypothyroidism is that associated with increased weight. There are scanty or absent menstruations, deposit of fat, drowsiness, slow pulse, dry skin, puffiness of the body, puffiness under the eyes, the type that I have called phlegmatic.

Under the title of "Chronic Benign Hypothyroidism" is grouped a combination of symptoms, such as loss of hair, diminution of the perspiration, changes in the skin, metrorrhagia. Other cases have backache, especially in the morning, without evident changes in the genital organs, and also metrorrhagia. Kocher lays stress on this backache as due to hypothyroidism.

Many cases of hypothyroidism are psychopathic, and, as the thyroid is influenced by mental stimulation and mental depression, mental treatment is of value.

Hyposecretion of the thyroid may cause mental depression, from simple apathy to real melancholia.

Neurotic symptoms are often suggestive of myxedema and curable by thyroid extract. In myxedema patients are depressed almost to the verge of melancholy without the self-accusation and despair of true melancholia. They are sluggish in their thought, unable to remember recent events, indifferent to their surroundings, without interest in personal and family affairs. They take an unfavorable view of their own condition; their will power is impaired. There is a mental inertia, they are inclined to be sleepy, and often sleep heavily both day and night and awake without any sense of refreshment (Starr).

Physically there is a dryness of the skin and hair, the skin does not perspire. It becomes pigmented, the hair falls out or

becomes gray. The surface of the body is cold, the hands and feet are always cold. Appetite and digestion are impaired. There is an interference with the calcium metabolism. There is a progressive gain in weight. There may be constant pain in the muscles and bones. (Levi of Paris says that in many cases of "chronic rheumatism" thyroid treatment is the best.) When nervous or neurasthenic patients complain of such symptoms, one grain of thyroid twice a day added to the other treatment is of value. In ten days the effect should be evident in less dryness of the skin, in relief from the sensation of cold, and in the decided improvement of mental activity.

Young girls with mental sluggishness, with symptoms resembling dementia præcox, and considered as cases of weak mindedness, may regain mental activity by taking thyroid. The symptoms are not enough to warrant the diagnosis of myxedema, but the dry, scaly skin, dryness of the hair, and coldness of the body suggests the use of thyroid extract.

In **hyperthyroidism** we have a transient or continuous oversecretion.

Congestive goiter shows an overfilling of the blood-vessels and occurs during menstruation or pregnancy, because of the intimate relation which exists between the thyroid, the ovaries, and the pituitary. Retained secretion means simple goiter. A hyperplasia and an increase of cells in the parenchyma indicate over-activity. If this occurs, then toxic annoyances of various degrees become evident.

There is a close relation between the ovaries, uterus, and thyroid, hence the goiter of adolescence and of pregnancy. In the climacterium this intimate relationship may prompt changes in the thyroid from hyperthyroidism to hypothyroidism.

The relation of the thyroid to the ovary sensitizes the thyroid gland. This, coupled with the various changes in balance which occur at puberty, menstruation, etc., is responsible for the instability which produces those various nerve phenomena due to thyroid hypersecretion or hyposecretion, or variations between the two, which make women the more sensitive sex.

The comparative frequency with which Graves' disease occurs in persons with status thymicolymphaticus is probably

something more than coincidence. On the one hand, therefore, hyperthyroidism may lead, as in Graves' disease, to changes in the functions of the ovaries. On the other, primary changes in activity of the sex glands may exercise a secondary influence upon the thyroid, and as a result symptoms resembling those of Graves' disease are produced.

Symptoms resembling those of Graves' disease may be associated with various conditions, as chlorosis, pseudochlorosis (swelling of the thyroid, increased cardiac activity, mental excitement, fatigue, pallor, without chlorotic changes in the blood). Symptoms resembling Graves' disease are often seen at the climacterium. *The remarkable incidence of Graves' disease in women, and the frequency with which its occurrence is associated with functional change of the sex glands, are factors of significance.*

There may be paroxysmal attacks of hyperthyroidism resembling very mild attacks of parathyroid tetany. Attacks may be associated with weakness, dizziness, cyanosis, very rapid and feeble pulse, and symptoms resembling collapse. Patients appear very sick. There may be associated diarrhea and uncontrolled movements of the hands and extremities. These attacks may come on during nursing, or after fatigue or irritations of various sorts. Such patients, aside from these attacks, have a marked tendency to premenstrual annoyances of the type resembling hyperthyroid symptoms.

Wolfsohn shows that extensive analogies exist between hyperthyreosis and anaphylaxis. Recent studies are tending to show more and more a correspondence in the blood pictures of the two conditions. "At least four points of concordance are noted—viz., leucopenia, mononucleosis, eosinophilia, and delayed coagulability. Other points of resemblance are seen in vasomotor excitability, dermographism, urticaria, and transient edema; outbreaks of sweating, bulimia, vomiting, and diarrhea, anxiety, hot flushes, tremor, pareses, convulsions, cardiac palpitation, tachycardia, asthma-like attacks, and hemorrhages of the mucosæ. The conclusion seems inevitable, that hyperthyreosis is an anaphylaxis. Graves' disease of the thyroid, whatever it is, results in the production of a heterolo-

gous albumin. Conversely, in anaphylaxis of exogenous origin, there should be a hyperfunctioning of the thyroid and perhaps of other glands of internal secretion. This can be almost mathematically shown in iodin anaphylaxis, which results in thyreosis. Iodin anaphylaxis does not result if the thyroid is able to detoxicate this substance. In endogenous anaphylaxis from hyperthyreosis it is probably the iodized albumin which behaves as a heterologous albumin. In Graves' disease this iodized albumin is produced in excess."

Hyperthyroidism is either an excess of thyroid or a dysthyroidism, and this question is not settled yet. Graves' disease may be an intoxication by iodin, on the theory that the thyroid takes surplus iodin out of the body and stores it up as iodothyrin. In most cases there are evidences of hyperplasia in the gland, yet the condition may in some of its phases be one of perverted function rather than over-secretion.

In all cases of hyperthyroidism the pulse-rate and the heart action are increased. I rarely make such a diagnosis without it. While tachycardia may occur in hypothyroidism also, I usually rely on a slow pulse for that diagnosis.

The vasomotor changes of hyperthyroidism produce a sense of warmth which is relieved subjectively in cold weather. On the other hand, a marked sensitiveness to cold speaks for hypothyroidism.

All changes, from mild depression or exaltation to melancholia and dementia, may be seen in hyperthyroidism, but the milder forms resembling neurasthenia are the most frequent; disorders of sleep, up to severe insomnia, are present in almost half of the cases of hyperthyroidism. Tremor is usually present in hyperthyroidism. Exophthalmos is not due to the hyperthyroidism, but possibly to adrenal or pituitary dysfunction. In Graves' disease there is generally an increase of mononuclear cells. Berry states that exophthalmos is evolved by accumulation of fat in the orbit.

The relationship between Basedow's disease and the female sexual sphere is indicated by the frequency with which this disease develops during the sexually active years. Amenorrhea is considered a frequent, even if not constant, symptom

of the disease. The ability to conceive is decidedly diminished. The disease is, as a rule, unfavorably influenced by pregnancy.

The thyroid undersecretes in many cases at first, producing perhaps physical weakness, tendency to fatigue, diminished sweating, loss of hair. It is possible that such evidences of diminished thyroid function, associated in some cases with muscular and joint pains, may precede or end in or complicate a change from hypofunction to hyperfunction. Involvement of the thyroid may be due to tuberculosis, tonsillitis, influenza, typhoid, lues, staphylococcus infections, etc. In other words, a lesion produced in the thyroid and resulting in lowered energy of the gland in part, leads to an attempt at *compensation*, and results in symptoms quite different from the early ones of depression. This view of hypothyroidism, associated with the early stages of hyperthyroidism, may account for the improvement obtained by thyroid treatment or by the use of iodin in cases of apparent hyperthyroidism (Dock).

Simple goiter may develop into Graves' disease through the use of iodids or iodothyrin, through the influence of puberty, pregnancy, menopause, and other strains. Graves' disease may degenerate into true myxedema. Sometimes symptoms of Graves' disease and of myxedema may exist together. This means that the greater part of the gland is inactive, and that what remains secretes an abnormal product, producing intoxication.

Graves' disease seems to have a tendency to be transmitted by heredity, and in families of such patients there is a tendency to neuroses, psychoses, and diabetes.

Neurotic Symptoms of Hyperthyroidism.—There is nervous excitability, very active mentality, tremor, muscular irritability, and quickness of thought. Excessive function of the thyroid, not sufficient to produce exophthalmos or goiter or a very rapid pulse, may produce symptoms of a nervous type simulating or complicating neurasthenia.

Certain neurasthenics are restless and cannot keep quiet, find it impossible to lie down or rest, are unable to keep their minds on any one subject for any length of time. They realize that the train of thought is unusual, and they fear insanity. They have a sense of heat in the body, a desire for cool air and fresh

air, a burning sensation, which leads them to sleep with light bed-clothing, and very frequently results in perspiration; the desire for cool air prevents them from going to the theatre or church or remaining in hot rooms.

The skin is shiny and moist, the hair is moist and glossy, and the patients are usually thin. There is tremor about the hands and knee-jerks are exaggerated; patients are subject to diarrhea; menstruation is altered, *sleep is poor*, there is complaint of sudden flashes of heat, pulse between 80 and 90.

When these conditions are present in a case of neurasthenia the thyroid gland is probably over-acting (Starr).

Thyroidectomy in animals does not produce glycosuria. Adrenalin injections, which in normal animals provoke extreme glycosuria together with an increased metabolism of albumin in the fasting state, do not produce glycosuria in thyroidectomized animals, even when sugar is given at the same time. Adrenalin produces in dogs, from which both thyroid and parathyroid have been removed, a marked glycosuria, more so than in normal animals. The effect upon metabolism of the suppression of parathyroid function is the reverse of that produced by the suppression of the thyroid, for, in true athyreosis, the assimilation of sugar is increased and the use of adrenalin is not followed by glycosuria.

The relationship between the thyroid and the metabolism of the carbohydrates suggests that this relation depends upon the pancreas. The thyroid is believed to promote the activity of the chromaffin (adrenal) system and to inhibit that of the pancreas. The direct results of thyroidectomy consist in reduction of the metabolism of albumin, fat, and salt. The indirect results include a hyperactivity of the pancreas, due to the removal of the inhibitory agent. The thyroid, the chromaffin system, and the infundibular portion of the hypophysis accelerate the process of metabolism. The pancreas and the parathyroids retard metabolism. There is a normal balance between the two, as a rule.

If thyroid extract or iodothyrin are given continuously for two or three weeks, the amount of CO_2 excretion will be increased 20 per cent. Thyroid extract has the effect of increasing the

capacity for nervous reaction and giving greater energy to phlegmatic people. It reduces constitutional obesity, but not obesity due to overfeeding (Biedl).

The flooding of the organism with thyroid substances exercises an *elective* stimulating effect upon the sympathetic, and it also influences the activity of those other internal secretory organs which have functional interrelationship with the thyroid (thymus, hypothysis, suprarenals, ovaries). Amenorrhea is sometimes benefited by thyroid, especially if there are other symptoms of insufficient thyroid secretion, such as increased weight and dryness of the skin. Administration of thyroid is supposed to stimulate bleeding by causing a dilatation of the blood-vessels, especially in the uterus and nose (Osborne), yet, on the other hand, the giving of thyroid helps the bleeding, especially in hemophilia.

It is said by some that insufficiency of the thyroid may cause hemorrhage, and, on the other hand it is claimed that too much of its secretion may cause hemorrhage. Too much thyroid increases the coagulation time of the blood. Too little thyroid diminishes the coagulation time of the blood.

We should not forget that cases which *simulate Bright's* disease may be simply cases which need thyroid.

Treatment.—Thyroid is often given in too large doses. One should rarely begin with more than one-sixth of a grain three times a day. And five grains three times a day should be a maximum dose, and then only in pronounced myxedema after several weeks. Many patients can only stand one-twentieth of a grain at first.

In rheumatism and allied states one-tenth of a grain, three times a day, is a prophylactic dose, and one-quarter of a grain three times a day is a therapeutic dose. These very small doses are sometimes of value in chorea.

Thyroid is valuable in menorrhagia and in renal and intestinal hemorrhage.

The majority of cases of hyperthyroidism are transient, and recover readily with appropriate medication and treatment. Change of climate, rest, administration of various gland extracts, etc., are of value.

The nervous symptoms include excitability, a change of habits, and taste. There may be glycosuria, pigmentation of the skin, sweating, and vasomotor instability of the skin. There may be a fidgety and nervous manner.

Physical or mental strain should be avoided. Rest in bed for a few weeks is advisable, on account of the tachycardia or muscular weakness or the nervous irritability and the other symptoms.

The various emotions rouse the thyroid to activity. The same is true of the sexual sphere and of the various diseases of the genitalia. Arsenic, coffee, tea, and alcohol, and the salicylates stimulate the thyroid.

The thyroid is quieted by rest and quiet, freedom from sexual relations, and correction of pelvic annoyances. A milk diet and glycerophosphates, belladonna, hydrastis, bromids, chloral, luminal opium and ergot.

We may use ovarin, extracts of the pituitary gland, thymus, and suprarenal. Thyroid should be contraindicated. Antithyroidin is sometimes valuable. It is a serum given internally in doses of ½ to 15 gm. a day. Intermittent treatment is advisable. It may be given subcutaneously, 1 c.c. every other day or every day. Rodagen is the dried milk of goats whose thyroids have been removed. Extract of suprarenal gland seems to work well, especially when combined with quinin hydrobromid. Adrenal nucleo-protein in doses of gr. i or more, t. i. d. is worthy of trial. Quinin hydrobromid, gr. v, three times a day, is valuable. It may be given for months or years.

℞. Ext. glandulæ suprarenalis..... gr. ij
Quininæ hydrobromidi..... gr. v
S.—One capsule t. i. d.

Sodium phosphate, one teaspoonful every morning, is also useful. It seems to be an antitoxin to the thyroid. Sodium glycerophosphate is very valuable. Ergot and digitalis aid the relaxed heart.

Potassium iodid is of value in simple goiter, causing it often to disappear.

The thyroid is stimulated by small doses of iodin, and the latter also stimulates the cerebrum and cerebration. Iodin is attracted to the cells of the thyroid. In Graves' disease the iodin is decreased in the gland and is in excess in the blood. In small doses iodin has a tendency to stimulate the gland and cause absorption of retained secretions. The specific action of iodin in goiter (not exophthalmic, not hyperthyroidism) results only if functionating gland tissue is present, and hypertrophy will recede if dependent on improper function or retained secretion. In parenchymatous goiter, where all the constituents are enlarged, a potassium iodid ointment may suffer. Simple hyperplasia, with good vascularization in the goiter of young people and in rapidly growing goiters, is well acted on by the iodin treatment.

Means and his associates found that about two-thirds of the cases of exophthalmic goiter showed either recovery or improvement by suitable treatment with x-rays. If no favorable response from the treatment is obtained prolongation of the method is not advised. A combination of treatment and surgery may accomplish more than either alone.

Means and Holmes state that in toxic adenoma, x-ray treatment acts as well as in exophthalmic goiter.

PITUITARY BODY

The pituitary body consists of three parts:

(1) The anterior lobe, which is glandular, containing solid columns of cells with wide thin walls of blood vessels; a general scheme of structures like that of the adrenal cortex, the islets of Langerhans, the thyroid, the thymus, etc.

2. The intermediate portion, partly investing the posterior lobe.

3. The posterior lobe (nervous) consisting of neuroglia cells and fibers, and containing pigment.

Injection of extract of the posterior lobe causes a rise in blood pressure, through contraction of the blood vessels, except those of the kidney. It slows the pulse through direct action on the heart muscle. A second dose, however, produces a fall in blood pressure.

Pituitrin slows the pulse after atropin; it constricts the coronary vessels but dilates the renal vessels. It incites uterine contractions, stimulates the musculature of the bladder, increases rhythmical movements of the intestines, through stimulation of Auerbach's plexus. It markedly exaggerates the rhythmical movements of the stomach (adrenalin relaxes unstriped intestinal muscles). It has a temporary galactagogue effect, acting directly on the epithelial cells of the mamma, it dilates the kidney vessels, acts directly on renal epithelium, acts directly on the secreting epithelium of the gastric mucosa.

The physiologically active substances are found in the nervous portion. The glandular part, however, seems essential to life, as is the case with the adrenal cortex.

Some investigators find many of the conditions supposedly due to hypophyseal lesion to be really due to trouble at adjoining areas in the base of the brain.

Schäfer states that two different principles exist in pituitary extract, one acting on the circulatory system, and one on the kidneys.

Führer states that the substance acting on the uterus is independent of that acting on the blood pressure.

A substance called tethelin is said to exist in the anterior lobe which substance promotes growth in young animals.

Functional hyperplasia of the anterior lobe promotes tissue growth especially in the skeleton, the skin, the subcutaneous tissues, the reproductive organs, and stimulates secondary sexual characters.

The posterior lobe is concerned with tissue metabolism. Insufficiency of the posterior lobe slows metabolic processes and the symptoms strongly resemble the phenomena of hibernation with its markedly slowed metabolism.

Degeneratio adiposo-genitalis with its accumulation of fat and disturbance of genital functions is thought, by Cushing, to be due to a minus of the anterior lobe.

Dystrophia adiposo-genitalis is generally supposed to be due to insufficient pituitary. In these cases, the obesity is apparent on the abdomen, buttocks, proximal parts of the extremities.

The genital organs are infantile, the secondary sex characters do not develop.

Diabetes insipidus is believed to be due to posterior lobe insufficiency.

It appears from modern investigations that the hypophysis plays a part in the human economy, from childhood up, which is of great importance in the way of skeletal growth, mental development, genital development, sugar tolerance, etc. It produces, by its over-secretion, or under-secretion, permanent and lasting changes in the bony structure of the body, in the accumulation of fat, and influences to a decided degree the mental and nervous make-up of the individual.

The hypophysis possesses an anterior and posterior part. The anterior seems to be concerned with processes of growth; the posterior seems to be concerned with metabolism, especially with that of sugar. If, in the growing child, the hypophysis fails to perform its functions, there is a failure in bone stimulation and tissue growth, there is failure in bony development, and the individual may become a dwarf. If the anterior lobe of the hypophysis functionates and secretes too actively during the years of growth, the skeleton becomes larger than normal, and if the process continues in the pre-adolescent stages, the individual becomes a giant. It can be readily seen that this tendency to become a giant exists so long as complete ossification of the epiphyses has not taken place. After the individual has attained his full growth in a normal manner, and after ossification of the epiphyses has occurred, over-activity of the anterior lobe stimulates bone growth, but not in the way of general increase in stature, for that is now no longer possible. It, however, produces changes in the bones of the face and hands and feet, producing the condition known as acromegaly.

The posterior lobe is intimately concerned with the metabolism of sugar. If there is failure of function on the part of this lobe, there is a tendency to gain in weight, and at any period of life adiposity may result. In the young growing child there is then a diffuse accumulation of fat over the entire body. If in the adult the same change occurs, the adiposity which is thus

associated with lack of function of the posterior lobe has the name dystrophia adiposo-genitalis, because the hypophysis has a decidedly close relation to the development and preservation of the genitalia. In the younger years, before adolescence, anomalies of the hypophysis, as a rule, cause failure of development of the ovaries and of the uterus and of the other structures characteristic of the female. After adolescence anomalies of the hypophysis result in atrophy of the genitalia. The same thing, lack of development of the genitalia, is found in giants and dwarfs. In the one case there is too little secretion, in the other there is too much, and yet with either type of imbalance genital dystrophy occurs. The same holds true in acromegaly. In fact, so pronounced are the changes in the sex glands in this latter condition that, in the minds of many investigators, hypofunction of the ovaries has been considered the primary factor in causing the changes in the hypophysis which are responsible for acromegaly.

Changes in the secretion and functions of the hypophysis have other effects than on growth and stature, than on the genitalia, than on the accumulation of fat and the metabolism of sugar. Changes in the secretion of the hypophysis are associated with alterations in other gland functions in the body. The relationship of the hypophysis to the adrenals, the pancreas, the thyroid, etc., is very close, but not so intimate as with the ovaries. The relationship of hypophysis to the psyche is close, for the various forms of hypophysis disease may produce nervous annoyances and psychic manifestations resembling hysteria, neurasthenia, etc.

Tumors of the hypophysis are not infrequently the cause of these diseases. In some cases they cause too much secretion, and in some cases they are responsible for a diminished secretion. In addition, they may produce symptoms due to their size and to the pressure which they cause within the cerebrum and on other nerve tissue. But, aside from this, functions of the hypophysis are altered and interfered with, without the presence of tumors. It seems that infections, intoxications, diseases of other glands, pregnancy, menopause, and other states promote structural or functional alterations in the hypophysis.

It must be remembered that either lobe may be involved independently of the other, or that both may be affected at the same time. Either may be oversecreting, or undersecreting, without regard to the changes occurring in the other portion. In this way various combinations of phenomena and symptoms may be produced, involving bony growth, stature, accumulation of fat, alterations of temperature and pulse, changes in the other glands, psychical alterations, etc., resulting in symptoms which can be classified under no definite heading, but which require patience and attention to eventually diagnose and treat.

Hypopituitarism.—We may have hypopituitarism originating before or after adolescence. If hypopituitarism predominates, there results adiposity with skeletal and sexual infantilism in childhood (Fröhlich). Adiposity with sexual infantilism of the reversive type results when hypopituitarism originates in the adult. The posterior lobe secretion possibly discharges into the cerebrospinal fluid. The anterior lobe discharges secretory products into the blood stream. The anterior part is closely related to other glands, in its control of skeletal growth. Posterior lobe is more closely allied to tissue metabolism, and to the activity of the renal and vascular systems. Normal posterior lobe activity is essential to carbohydrate metabolism. A diminution of this secretion leads to a high tolerance for sugars, with a resultant accumulation of fat. In the majority of cases of adiposity there seems to be incomplete metabolism. The ineffectual burning up of the carbohydrates causes subnormal temperature. This is also common to insufficiency of the thyroid and adrenals.

Many cases of infantilism are due to a primary thyroid insufficiency. "Many cases regarded primarily as of thyroid origin, especially cretinoid states, may actually be due to defective hypophyseal activity, which is often associated with actual enlargement of the thyroid. Many types of skeletal undergrowth, as we know from the action of the anterior lobe in processes of growth, are due to hypophysis rather than thyroid. Hypophyseal cretinism and infantilism are recognizable, clinical entities. Adiposis dolorosa is probably disturbed metabolism, secondary to disease of the ductless glands.

Thyroid extract is actually of benefit in cases of hypophyseal obesity. Most cases of undoubted hypopituitarism have exhibited some degree of psychic disturbance, varying from nervousness to epilepsy and actual mental derangement. Pituitary deficiency, like thyroid deficiency, may cause signs of mental instability without encephalic lesion. And there can be little doubt but that many of the psychasthenias and neuroses of one sort or another will prove to be associated with ductless gland disturbances, more particularly with those of hypophyseal origin" (Cushing).

A powerful galactogogue substance exists in the posterior lobe. The posterior lobe extract has a specific action on smooth muscle and especially on uterine fibers.

In preadolescent hypopituitarism there is a tendency toward persistence of sexual infantilism and an imperfect or delayed acquirement of the so-called secondary sexual characteristics, just as in hyperpituitarism after puberty there is a tendency to testicular hypoplasia, impotence, amenorrhea, and some loss of secondary characteristics.

In pregnancy the pars anterior shows a multiplication of large neutrophilic elements. After labor the gland involutes, but never goes back to its previous size. This change, occurring in successive pregnancies, may bring about a physiologic inactive condition of the gland, and may produce the adiposity, loss of hair, asthenia, subnormal temperature, often seen after many pregnancies. On the other hand, over-activity may persist, leading first to acromegalic changes with final insufficiency. The interstitial cells of the genital glands and the corpus luteum exercise an important rôle in interglandular relations.

This hypophysis gland reacts to bacterial intoxication, and animals subjected to a partial hypophysectomy are extremely susceptible to infections, so that it is evident that the gland secretes some antagonistic substances.

With inefficiency of the hypophysis, somnolence is noticeable, just as in hibernation; there is a great tendency toward sleep, subnormal temperature, slow pulse, lowered metabolism, a definite hypesthesia of the body to painful stimuli, and a hypoplasia of the sexual glands.

Hyperpituitarism.—If hyperpituitarism predominates there is overgrowth, resulting in gigantism when the process antedates ossification of the epiphyses (Launois); acromegaly when the process occurs after ossification. Hypophysis hyperactivity before adolescence and before ossification produces large stature; after ossification it produces acromegaly.

To be responsible for skeletal undergrowth, glandular insufficiency must have been evident before the age when full stature is normally attained; that is, before or during adolescence, though hypopituitarism later will dwarf the stature. This is likewise true in deficiency of the thyroid, the adrenals, and the thymus.

There is only one certain experimental method of inciting skeletal overgrowth, and that is by early castration. The hypertrophic enlargement of the pituitary gland, or the histologic hyperplasia, are primary in the case of acromegaly and gigantism, but are secondary in the case of eunuchism.

Hypophyseal hyperplasia may be responsible for the rapid body growth which normally occurs at puberty. An exaggeration of the growth produces what is known as a "normal giant," an individual normally proportioned, sexually intact, with great physical strength. If this growth ceases for a time, then subsequent hyperplasia will produce acromegaly if ossification has taken place. As stated, acromegaly occurs if there is an interval between the two stages of hyperplasia. (An early postadolescent period of hyperpituitarism leads to physiologic overgrowth or normal gigantism.)

Many cases of hyperplasia show quiescent periods, after which recrudescences may occur. In other cases the process is permanently checked, the clinical traces of skeletal overgrowth being the only evidence. In others there results a change to glandular insufficiency, as the result of involution which may follow on the process of hyperplasia. The early growing child may show only coarseness of the tissues or other minor signs of a mild hyperplasia (Cushing).

"A spontaneous mellituria, even of such a degree as to simulate diabetes and to be accompanied by furunculosis, is not uncommon in acromegaly and gigantism, and, I presume, that

during the actual period of hyperpituitarism a low sugar tolerance, if not actual glycosuria, is probably found in all cases. Glycosuria is only a temporary symptom, and a giant or acromegalic may be in an active, quiescent or retrogressive stage of hyperpituitarism, and hence metabolism changes accordingly. The changes differ as much in the early and late stages of acromegaly as occurs between Graves' disease and myxedema" (Cushing).

Whether obesity from castration may not occur through the resultant diminution of the ovarian function, or whether, contrariwise, the obesity of castration may not occur through the associated change in hypophysis activity, cannot be settled. Whether the obesity of castration is due to the fact that the hypophysis, in spite of its hypertrophy, or because of an insufficient hypertrophy, does not make up for the loss of the ovarian secretion, is to be determined in the future.

There are certainly puzzles in this question. That conditions which are to be referred to increased activity of the hypophysis, such as acromegaly on the one hand, and a partial destruction of the hypophysis on the other hand (hypophysis obesity), should both cause an atrophy of the genitalia, seems strange. A like condition exists in the sphere of the thyroid, where Graves' disease and myxedema both lead to an inhibition of the genital function.

"At puberty changes occur which, if the hypophysis is unstable, may so alter the biochemical processes of the body that they border on the pathologic. The rapid increase in stature during the adolescent period probably accounts for the occasional spontaneous glycosurias of this period. This is probably true also in pregnancy in which there is a transient physiologic hyperpituitarism."

"In pregnancy, hypertrophic changes occur in the gland. Functional alterations occur comparable to those which more obviously affect the thyroid. It is possible that hyperplasia of the hypophysis may account for some symptoms during the last weeks, when there may occur fleeting bitemporal hemianopsia, hypertrophy of the tubinates, temporary enlargement of the lips and nose, with thickening of the tissues of the hands

and feet, the frequent glycosurias of pregnancy, and increase in stature" (Cushing).

We may have an over- or underactivity of both anterior and posterior lobes or of either one. There are mixed or transition cases with some features of both states. This may be called dyspituitarism. There may have been an overgrowth of one or both lobes, followed by insufficiency of one or both lobes. Other individuals suggest by undergrowth and adiposity, as well as by high sugar tolerance, an early interference with both lobes. Dystrophia adiposo-genitalis (Bartels) is due to glandular insufficiency. All cases of original hyperpituitarism associated with tumor may end in hypopituitarism. Many cases with existing hypopituitarism show traces at least of an early tendency to hyperpituitarism. Stages of pathologic overactivity of the gland tend toward a final stage of sluggishness in the way of secretion. Symptoms of one may be mixed with symptoms of the other. Hence the value of the term dyspituitarism.

Just as in the hyperthyroidism there are periods of remission and spontaneous cure, so the same occurs in hypophysis affections.

"It is probable that there are strains which run through families on *Mendelian laws*, and which betray the existence of ductless gland irregularities, unrelated to any postpartum influence. This includes inherited instability of the hypophysis. There are authentic instances of family diabetes of both kinds (mellitus, insipidus). Instability of the hypophysis may cause in various members of different generations hyperfunction in some, hypofunction in others. A functional glandular instability may make various members of the family susceptible to various alterations."

Polyglandular Combination or Syndrome.—This includes patients showing unmistakable evidence of ductless gland disorders. In acromegaly there is a frequent co-existence of a goiter. There is early glycosuria, amenorrhea, pigmentation, and asthenia, suggesting affections of the thyroid, the pancreatic islets, the ovary, and adrenals. These organs are all involved, either by the underlying biochemic disturbance which is the

background for many ductless gland disorders, or else they are secondarily implicated during the compensatory readjustment of metabolic processes consequent upon the primary derangement of the gland in question. A primary hypophyseal derangement is capable of bringing about a functional unsettling of the entire glandular series (Cushing).

"In the case of the thyroid and parathyroids the pituitary and pineal bodies, the adrenals, thymus, pancreatic islets, testis and ovary, disturbances of function, whether in the direction of increased or of lessened activity, will doubtless occasion reciprocal alterations in one or another of the correlated glands. Despite the ultimate polyglandular nature of the picture from the pathologic point of view, a primary disturbance of each one of these glands, whether in the direction of overactivity or underactivity, doubtless will be found to possess its own characteristic clinical syndrome, which differs from that of each of the other glands."

As a result of experimental reproduction, the symptoms associated with primary glandular insufficiency are the better known. Cretinism, myxedema, Addison's disease, pancreatic diabetes, parathyroid tetany, and the eunuchoid state are clinically recognizable. To this is to be added the dystrophia adiposo-genitalis, due to hypophyseal deficiency and possibly hypothymism and hypopinealism.

There are constant changes in the hypophysis during pregnancy. This gland is enlarged, and there is an increased secretion in pregnancy. Tandler and Gross compare the frequent changes in the face of pregnant women, especially the coarseness of the features, with the same changes occurring in acromegaly. It is exclusively the anterior lobe of the hypophysis which is altered in pregnancy. It is possible that the periosteal bony growths of pregnancy are due to the changes in the hypophysis. Whether the enlargement of the thyroid in pregnancy stands in relation to the hypertrophy of the hypophysis cannot be definitely stated, neither can the question be answered whether the enlargement of the hypophysis may not be hypertrophy designed to substitute the lack of function of the ovaries. It is also possible that the change in the hypophysis is the result of

changes in the uterus (ovum), and is designed to inhibit the function of the ovaries, or the changes of the hypophysis and the ovaries may be due to a common cause.

In recent years hypophysis diseases have been treated successfully by operations. Because of the antagonism between hypophysis and ovary, Thumin advises the treatment of acromegaly with ovarin, and advises the use of hypophysis extract for the treatment of uterine bleedings and other conditions due to hyperfunction of the ovaries. The extract of the posterior lobe acts like adrenalin, strengthens and slows heart activity, increases the amount of urine, and increases the contractility of smooth muscle fibers. For the last reason, pituitrin acts well on the bladder and uterus. It has a styptic action in various bleedings in the non-pregnant uterus, is a bladder tonic, and acts well in some cases of osteomalacia, and of course acts well in uterine atony in labor.

Hypopituitarism and Hypophysis Therapy.—After a complete removal of the hypophysis, a subcutaneous or intravenous injection of the emulsion of a single fresh gland would temporarily arouse to apparently normal activity a somnolent animal in whom a subnormal temperature betrayed the onset of a cachexia hypophyseopriva.

The manifestations of glandular deficiency, whether or not they are accompanied by pressure symptoms or by evidences of pre-existent overactivities, with more or less marked overgrowth, are (Cushing):

A tendency to subnormal temperature.
Dry skin.
Loss of hair.
A slow pulse.
A lowered blood pressure.
Asthenia.
Increased assimilation limits for carbohydrates.
Often associated with a tendency to adiposity.
Obstipation.
Polyuria.
Psychoses.
Tendency to epileptiform seizures.

The malady is a polyglandular one, and hence, in addition to hypophysis, may be helped by other glands, such as *adrenal and thyroid*. Even after a year of glandular feeding, amenorrhea may be relieved and *libido-et-potentio sexualis* may be restored. *It only rarely has a marked effect on obesity*. A combination of thyroid and hypophysis may stimulate tissue katabolism. Hypophysis extract may produce mental and physical rejuvenation; raises body temperature, raises blood-pressure, benefits obstipation, removes the drowsiness, improves mental activity, on the use of 12 grains of the dried whole-gland preparation three times a day. In some cases it works beautifully by hypodermic use.

Adipositas dolorosa, *universalis*, and *dystrophia adiposo-genitalis* are due to posterior lobe deficiency. To this symptom-complex of adiposity is added high sugar tolerance, subnormal temperature, slowed pulse, asthenia, drowsiness, all due to deficiency of the posterior lobe. The reverse condition follows on posterior lobe administration; namely, emaciation, spontaneous glycosuria, slightly elevated temperature. This may be produced by injections or by administering gland preparations by mouth. The adiposity of hypopituitarism is a generalized one, invading other organs, too, such as the liver. Increased deposition of fat may occur, also with deficiencies on the part of the sexual glands, the thyroid, and possibly, too, the pineal and adrenal.

Insufficiency of the posterior lobe may be associated with stimulation or inhibition of the anterior lobe; hence, coupled with obesity, we may have the combination of overgrowth with sexual precocity or the reverse, or undergrowth with sexual precocity or the reverse. (The sexual precocity, I think, may depend on other elements.) Hypertrichosis, adiposity, pigmentation, high blood-pressure, may be due to hyperadrenalism. Precocious sexual development, overgrowth, adiposity, may be due to hyperpinealism.

Dercum's disease means adiposity, tenderness and pain, asthenia, psychosis.

Extracts of the posterior lobe possess diuretic properties. The administration of posterior lobe extract causes an increase in the urinary output. A hormone in the pars nervosa activates

renal secretion. There is, therefore, difficulty in explaining the diuresis which accompanies hypopituitarism, for one would expect these individuals to show a lowered urinary output. Some of the cases constitute almost a diabetes insipidus. In experimental hypophysectomy the amount of urine in animals increase to 2000 c.c. in twenty-four hours.

Temperature.—Subnormal temperature is a characteristic of insufficiency. This can be raised to the normal by glandular administration. There is a thermic reaction to the subcutaneous injection of extract of anterior lobe in animals in whom a deficiency of this part has been produced. In individuals with subnormal temperature a sufficient dose of the whole gland restores normal temperature. No thermic response follows the injection of saline solution of anterior lobe in normal animals. Injections of posterior lobe extract in hypopituitarism cause no thermic response.

Blood-pressure.—Hypopituitarism means low arterial tension, often below 100. When patients complain of asthenia, also, the pressure may be down to 70. Even in some cases, where the anterior lobe is still hyperactive, the pressure was low. There are some exceptions as regard low pressure with insufficiency, for the tension may be high. The low pressure with asthenia and pigmentation suggests that even where the malady is hypophyseal a secondary change in the adrenals, in the way of inactivity, may be partly responsible for these symptoms.

Low blood-pressure is present with hypopituitarism. Many acromegalies have a slight eosinophilia.

Drowsiness, torpidity, occurs with *hypopituitarism.* Many of the patients show an inclination to doze throughout the twenty-four hours; in others, the somnolent period occurs in more or less definite cycles, with intervening days of normal response. Glandular therapy improves the mental activity and lessens the drowsiness. *Sleeplessness* would be expected to accompany hypersecretion, but this is rarely noted.

Anesthesia, or insensitiveness to pain, and obstipation are associated with hypopituitarism. Psychic disturbances—some are due to excess or perversion of secretion, others to insufficiency.

With hyperpituitarism *temperamental* changes are often apparent with *wakefulness*, lack of *concentration*, indecisiveness, *irritability*, distrust, in other words, *psychasthenic states*, which are not unlike those with which we are familiar, in moderate degrees of dysthyroidism. When hyperpituitarism dates from early life, the individual is usually deficient in educational training from the outset.

With *hypopituitarism* there are gradations of disturbance from mild psychoses to extreme mental derangement. There is inability to *concentrate;* there is impairment of memory. Former powers of mental activity may be restored with the readjustment of a physiologic balance through glandular administration. In most cases of hypopituitarism sufficient to cause adiposity, deviations from the normal intellectual level may be expected. There may also be drowsiness. Psychic disturbances of varying degree are common.

Dercum's disease includes psychic derangement.

Epilepsy.—Many patients with hypopituitarism have shown epileptiform tendencies.

As the posterior lobe secretion normally enters the cerebrospinal fluid, and thus comes in contact with the solution which bathes the cortex, it is possible that its diminution in hypophyseal disease may unfavorably affect the activity of the cortical cells.

CELLS OF LEYDIG AND TESTIS

The secretion of the spermatogenic tubules of the testes mixed with the secretion of the accessory sex glands, is the vehicle for the spermatozoa; but an internal secretion of the testes is produced by the cells of Leydig.

Berthold, in 1849, removed the testes from young cockerels and transplanted them near the intestines, and the cockerels grew into normal cocks, proving that the testes affect the blood and the blood affects the whole animal.

To this internal secretion of the testes are due the secondary sex characteristics of the male. This specific secretion is responsible for the comb and spurs of male fowl, the antlers of stags. In the human being, it is responsible for the growth of

hair on the face, growth of the thorax, the characteristic shape of the pelvis, changes in the larynx. It exerts an influence on the growth of the prostate.

Associated with the activity of the testis, is the co-ordinative influence of the pituitary anterior, the adrenal cortex, and the thyroid. These glands are intimately concerned with the stimulation of growth and with differentiation. Therapeutically, orchic extract is in many cases an excellent tonic.

The great development of the interstitial gland tissue is synchronous with spermatogenesis. After ligature of a vas deferens, the spermatogenic tissue degenerates, but the interstitial tissues do not. (Hence the value of the Steinach operation.)

The absence of functional testes causes abnormal growth of bony tissue. The bones of castrated animals are longer, especially so the radius and tibia. The activity of the sex glands is opposed to elongated body growth, and tends to a destruction of fat or to a prevention of its formation.

In short, the internal secretion developed in the cells of Leydig plays an all-important part directly and indirectly through its relationship to other of the ductless glands, especially the adrenal cortex and anterior pituitary, in giving the male his masculine characteristics.

The interstitial cells of Leydig are polygonal in shape, with a round nucleus. The interstitial cells prior to birth act as sexual determinates and at birth form the greater part of the interstitial tissue which constitute the major part of the testes. They contain lipoid granules. Fine lipoid granules are seen between the embryonic epithelial cells of the tubules. At birth, regressive atrophy takes place in these cells as a physiologic process, and the cells almost completely disappear at four to six months. At ten years of age the tubules of the testes are separated by a considerable amount of interstitial tissue and groups of nuclei, like those of immature Leydig cells (Mott).

The interstitial cells after birth undergo a regressive atrophy and disappear. At ten years the tubuli seminiferi are only a little larger than those at four months; there is no lipoid in the interstitial tissue. The interstitial tissue contains no lipoid,

and function has therefore not commenced in the interstitial cells.

At puberty and adolescence the tubules have increased in size, owing to active proliferation and spermatogenesis. Abundance of mature interstitial cells are present, which are undergoing active functional change. They contain lipoid and lie upon a lymphatic space which surrounds the tubules. The appearance of the many immature interstitial cells resemble in many respects the appearances presented by the interstitial cells in advanced cases of dementia præcox.

At fifteen, sections of the testes show active spermatogenesis, lipoid granules in the Sertoli cells, and interstitial lipoid. This interstitial lipoid was found in drops and droplets in the lymphatics and lymphatic clefts, also in the Leydig cells which have now reappeared in the interstitial tissue. Their reappearance is therefore synchronous with the first appearance of the secondary sexual characters which it has been proved they determine (Mott).

The development of the spermatic epithelium corresponds with the appearance of lipoid in the interstitial cells and the tubules, and its absence with the signs of an absence of formative activity in the tubular epithelium. This supports the view that these cells of Leydig perform the double function of providing a hormone and the raw material for formative activity of the spermatic epithelium.

The Leydig cells are found at all ages up to 86, though in diminished numbers and corresponding, generally speaking, with the degree of spermatogenic activity, though by no means always.

The Leydig cells have a comparatively short life, and are continually maturing, decaying, and being renewed. Microscopic appearances indicate the continuous development of new interstitial cells which mature, actively function, and decay (Mott and Such).

In the tubules, the Sertoli cells and spermatogonia rest upon a layer of connective tissue and endothelial cells, external to which is a lymph space. Resting upon the external wall of the lymph space are the Leydig cells.

Droplets of lipoid substance are present in this lymphatic space, in the lymphatic clefts of the interstitial tissue, and in the Leydig cells. Very fine droplets can be seen in the Sertoli cells, and these undoubtedly serve for the growth and development of the spermatozoa.

The interstitial cells probably perform a double function, producing a hormone entering into the circulation and the lipoid passing into the lymphatic spaces surrounding the tubules and then into the Sertoli cells. In the undescended testis the tubuli seminiferi are inactive and undeveloped, but the interstitial hormone cells persist. They contain these lipoid granules, so that they retain the function of providing a sexual stimulant apart from spermatogenesis.

Thus they provide the mental and bodily conditions required for coitus. It is well known that cryptorchids have sexual desire and that ligature of the vas deferens on both sides, which causes complete obstructive atrophy of the tubules, and exposure of the testis to the x-ray, which destroys spermatogenetic function, leave the interstitial cells intact, and with their integrity the sexual appetite persists. Circulating microbial toxins from chronic diseases, produce pathological changes indicating functional exhaustion of the interstitial cells. These changes are more marked than in the epithelial cells of the spermatic tubes (Mott and Such).

"Normal internal secretion of the gonads does not take place without normal interstitial cells. Neither spermatozoa nor any other generative cells, with the possible exception of the cells of Sertoli and spermatogonia, are necessary for the internal secretion.

Full hormonic activity is possible even in the absence of all stages of spermatogenesis, that is, when the tubules by a regressive development are brought to a juvenile stage.

Small fragments of the gonads can perform a quantitatively normal hormonic function even where there is no hypertrophy of the interstitial cells.

Normally developed interstitial cells are necessary for the normal hormonic action of the gonads, but no definite conclu-

sions can be drawn as to the significance of different stages of generative cells to this function.

Whether the origin of the interstitial cells is connective or epithelial, the cells are histologically glandular. All the effects, which the endocrine glands give on the sex characters probably act through the medium of the gonads.

Completion of spermatogenesis is not necessary to the performance of the endocrine function. The sex characters can be normally developed when a fragment of only about 1 per cent. is present in the body. It is highly probable that the interstitial cells are producers of sexual hormones; it may be that they receive some impulse from the developing generative cells, like the granulosa and the theca interna of the ovaries. Normal endocrine function is possible even when no other generative cells than the cells of Sertoli and spermatogonia are present in the tubules. (These observations having been made on animals are no evidence of the systemic or mental influence exerted by this secretion in the human being)" (Lipschutz).

GONADS-STEINACH OPERATION

Growth is influenced by the interstitial tissues of the gonads, by the anterior lobe of the pituitary, and by the thyroid. These three organs normally work in cooperation, and a disturbance in one, would influence both the processes of growth and the relations of the other organs to that process (Cannon).

"The most frequent and most prominent clinical manifestations, as the result of the new activity of the puberty glands after the Steinach operation, seemed to be due to increased thyroid activity. Outside of the thyroid, reactivated puberty glands seems to influence essentially those glands that are most prominent, or delinquent, in the patient's constitution. Distinct changes in the gonadal sphere appeared mostly in patients with a gonadal or partly gonadal constitution. Increase of sexual activity was not regularly observed. The Steinach operation increases the activity of the puberty glands. This reactivation has an influence on the endocrine system in the sense of stimulation, regeneration, and restoration of equilib-

rium. No injurious effects have been observed" (Harry Benjamin).

Brown-Sequard, in experimenting on himself in 1889, found that by injecting an extract derived from the testes of dogs, definite dynamic effects were produced. He regained much of his former strength, fatigued less easily and was able to do work greatly in excess of what he had been capable of before. His mental faculties were increased, and intellectual efforts became easier. He noticed that he was greatly relieved of constipation and believed that the testicular extract had an influence particularly on the spinal cord.

Stanley's paper deals with one thousand injections of animal testicular substance into 656 human beings. The greater number received only one injection, while to some were administered as many as seven. In about 90 cases, a ram's testicle, the size of a dollar was implanted by operation into the scrotum or abdominal wall.

It was found that these heterogenous grafts were gradually absorbed.

Again, testicular substance of the freshly killed animal was cut into strips with a knife or cork borer, in sizes suitable for the filling of the pressure syringe.

By this means the semi-solid testicular substance was injected by force underneath the skin of the abdomen. With this method there were comparatively few sloughs, and the patient was not subjected to a week's hospital inconvenience.

The testicles of goats, rams, boars and deer have been used. So far as can be determined there is very little difference in the effects produced by testicular material obtained from various animals.

In some patients the substance injected will remain under the skin and be plainly felt as a shot-like body for several months, while in others it disappears within a few weeks.

The possible advantage of using the whole testicular substance instead of the extract as Brown-Sequard did, is that it is absorbed so slowly that in this process of absorption the hormone is gradually given off, producing a continuous effect. The extract may be absorbed within a few hours.

From a compilation and study of data from these 1000 treatments, it is believed that testicular substances do have a decided effect on conditions of general asthenia. This term is applied to patients who are underweight, lack energy, sleep poorly, have scant appetite, and, to use their own expression, are "all run down." With them, nothing definitely pathological can be found. Usually within the first week after the treatment they gain in weight, have increased appetite, enjoy their work, and evince a general buoyancy.

Of the total number of patients, 81 reported increased sexual stimulation. This was evidenced to them by frequent erotic dreams with emissions, and frequent erections without undue sexual cause.

Whether testicular substance contains some inherent power like adrenalin to influence asthma, or whether by means of a hormone sent into the blood stream, acting upon the adrenal glands, adrenalin is elaborated and thus alleviates asthma, is not known. But, of the 21 patients of this series who suffered from asthma, 18 secured relief or had the severity of their attacks greatly diminished.

Among the patients treated, 34 were senile. Twenty-seven of them showed improvement in that they were more energetic, ate better and showed more activity mentally and physically. The observations made on these old men were in many respects similar to those which Brown-Sequard made on himself.

Fifty-six patients were suffering from neurasthenia. Some of them were "hospital pests," never benefited by anything. Of this number, however, 33 cases showed decided improvement. They gained in weight, felt well, and apparently forgot many of their fancied ailments.

Stanley summarizes the results of implantations of testicular substance in human subjects. "A striking objective improvement was seen in numerous cases of general asthenia, acne vulgaris, asthma and senility. Subjective or objective improvement was seen in various cases of rheumatism, neurasthenia, poor vision, and a few other conditions. In general, testicular substance seems often to have a beneficial effect in relieving pain of obscure origin and promotion of bodily well being."

DEMENTIA PRÆCOX

Are the regressive atrophy of testis and neuronic functional decay in dementia præcox, signs of germinal lack of durability of two of the most important structures of the body?

Changes in cerebral cortex, basal ganglia, pons, medulla, inferior cervical ganglia are shown by the microscope to be present in dementia præcox.

Mott notes these changes in the nervous system (neurones):

(*a*) Signs of suppression of function; swelling nucleus, biochemical changes in the nucleus, vacuolation, disappearance of Nissi granules; even destruction of cytoplasm and its dendritic processes without destruction of the axon.

(*b*) Signs of hypofunction; accumulation of lipoid granules in the cells of the cortex, basal ganglia, and other structures of the central nervous system far exceeding physiological limits. (The same is found in old age, but affecting only the scattered cells.)

"All neural processes (therefore all psychic processes) are dependent on oxidation processes taking place at the synapse in the gray matter and, as in all the testis, upon oxidase granules. These granules are found upon all the dendrites and body of the cell, but not on the axon. They are very abundant in the layer of the plexiform cells (second type of Golgi) which form the synaptic junctions of the cells of the first type. When the molecular oxygen is converted into active, nascent, atomic oxygen by the catalytic action of the phosphorus and iron of the nucleus, a progressive failure of function of the nucleus to build up new nuclear matter is the essential morbid change in the testis."

"A similar progressive failure in the formation of the nuclear substance in neuronic systems may be postulated as the cause of suspension or suppression of neural function by a consequent failure in the oxidative processes essential for neural activity."

"The fact that castration in early life does alter the mental and bodily characters of the individual, yet does not produce insanity, indicates that the changes in the central nervous system in dementia præcox are not dependent upon the regres-

sive atrophy of either the interstitial or the spermatogenic structures, but that dementia præcox and dementia presenilis constitute an innate germinal defect in structures which are essential for the preservation of the species, viz.; the brain, the organ of external relation, and the reproductive organs."

There is an inherent lack of durability or vital energy in the neurones, especially those latest developed ontogenetically, and phylogenetically. But this lack of vitality in dementia præcox is probably not confined to these two tissues; being of biogenetic origin, it affects sooner or later all the active functioning tissues of the body, and there is a corresponding deficiency in oxidation processes.

Examination of an emulsion of the testis in 24 cases of general paralysis, with few exceptions showed spermatazoa, whereas in 27 cases of dementia præcox quite two-thirds showed no spermatozoa.

"Investigations are not sufficiently advanced to do more than conjecture that the manic depressive state may possibly be related to the deficiency in the formative activity of the Leydig cells and the influence of such deficiency on the endocrine system. Kraepelin believes that an intoxication arising from a disturbance of the normal functions of the sexual glands is an essential pathological condition in dementia præcox. If it be granted that the psycho-physical energy of the sex instinct is activated by hormones secreted by the interstitial cells, a deficiency would be associated with a depression of psycho-physical energy, and the mental disorder would be revealed. An excess or deficiency of the sexual hormone may certainly cause a disturbance of the normal biochemical equilibrium of the endocrine gland function, sufficient to make a latent potential psychotic person actively anti-social and thus reveal the mental disease."

In dementia præcox there is usually a simultaneous regressive atrophy of both the interstitial cells and the spermatogenic cells of a progressive character.

If in young adults we have a condition in many ways similar to senile changes, it may be regarded as probable that there is a germinal precocious senility, and therefore a formative in capacity of the reproductive organs in dementia præcox which, arising

at puberty or early adolescence, in the great majority of cases progresses and finally leads to a complete loss of reproductive power.

It may, therefore, be presumed that in dementia præcox there is a regressive atrophy and failure of function of the interstitial cells coincident with, and in great measure proportional to, the regressive atrophy of the spermatic epithelium. With this regressive atrophy is a diminution, and in a few cases an almost total disappearance of the interstitial lipoid.

Mott divides the regressive atrophy in the testes in dementia præcox into three stages:

1. The first stage, in which the changes indicate the formation of normal and degenerate spermatozoa and commencing failure in the formation of normal interstitial cells.

2. In the second stage there is, in addition, an obvious shrinkage of many of the tubules, and failure of spermatogenesis. The mature interstitial cells are fewer in number.

3. In the third stage, the tubules either show no spermatogenesis, or only a few tubules, relatively, show some spermatozoa. There is a failure of formative nuclear activity, and many or all the tubules consist only of the very thickened basement membrane lined by Sertoli cells. These cells contain usually lipoid granules in the syncytium, and when this occurs there is lipoid in the interstitial tissue and cells. This indicates that the essential feature of the atrophy is a primary germinal defect.

Previous studies show that the changes in the reproductive organs is a part of a generalized germinal defect of durability and vital energy of the whole body, most manifest in the brain, especially the cortex, and the reproductive organs.

THE OVARIES

The mature ovary contains ova, primordial follicles, atretic follicles, maturing follicles, corpora lutea, corpora albicantia, interstitial tissue, and Leydig components.

The ovaries *initiate* processes ending in regular menstruation; when they are removed menstruation ceases.

Regressive corpora lutea may be found in the week preceeding menstruation but more often in the week following menstruation. There may, however, be present, none at all related to the menstruation just preceeding or about to follow.

Ovulation and active corpora lutea may be noted at all stages of the menstrual cycle, which proves that the corpus luteum does not initiate menstruation. There may be complete absence of corpora lutea in both ovaries, either before, during or after menstruation. Therefore, as might be expected, a regressing corpus luteum is not always found associated with an active corpus luteum. There is no definite relation between the state of regression of one corpus luteum and the degree of development of the next.

The presence of a developing corpus luteum does not exclude the presence of growing follicles. But in the vast majority of cases, where a corpus luteum is absent, one or several mature follicles are present. Just before, or after menstruation, most normal ovaries have either a developing corpus luteum or a growing or mature follicle, or both.

The corpus luteum comes from the epithelial cells of the Graafian follicles and the inner theca. The columns of cells of the corpus luteum look not unlike those of the adrenal cortex. The corpus luteum is said to stimulate the growth and activity of the mammary glands. It is said to be a source of cholesterin. Many consider it to be a galactagogue. It promotes hyperemia of the genitalia, inhibits ovulation, prevents ovulation during pregnancy, aids nidation, protects the growth of the ovum. It sensitizes the endometrium and makes it react by overgrowth into deciduoma in association with the mechanical and enzyme stimulation of the impregnated ovum.

There is no typical stage of follicular development associated with definite stages of the premenstrual period, and mature follicles may be even absent before menstruation. At the menstrual period, then, an ovary may contain primordial follicles and the atresic follicles as the only proliferating elements. Theca proliferations have the histologic characters of an endocrine gland. Since primordial follicles are never absent and as an ovary may contain, in addition, either de-

veloping follicles or follicles with a thecal gland, or corpora lutea, it may be stated that proliferating elements having secretory functions are always present.

Examination of the ripening Graafian follicles shows the cells of the theca interna. In these cells and between them, and between the cells of the zona granulosa are numbers of lipoid granules. A section of the ovary of a child aged eighteen months shows the theca interna surrounding a Graafian follicle. Inasmuch as from early infancy onward Graafian follicles with these cells of the theca interna are continually formed, it may be presumed that they have a function. Now the somatic cells possess both male and female characters, but the male are dominant. It seems therefore probable that these thecal cells are continually being formed under the stimulus of follicle development. As they do not become mature enough to rupture, but form atretic follicles, it may be presumed that this follicular formation serves the purpose of secreting a hormone to maintain the female characters in the somatic cells.

Young pullets that have had the ovaries removed, develop into birds that look like cockerels and behave like cockerels.

Multiple degeneration of the follicles, mass regression of cystic follicles, are not associated with uterine bleedings. Hyperplasia of the endometrium with hemorrhage, on the other hand, show in the ovaries pea to grape size follicle cysts with preserved epithelial layer and *proliferating* granulosa epithelium. If many such persist and none ripens to a corpus luteum, then hyperplasia of the mucosa and hemorrhage are noted.

The substances produced by the various elements of the ovaries are different and have a distinct rôle as regard menstruation. The developing follicular apparatus is the agency which gives rise to rut in animals, and to menstruation. The corpus luteum has an opposite effect.

Seitz, Wentz, Fingerhut, found two substances in the ovary, one a lipamine which causes growth of the uterus and stimulates bleeding, two, a luteolipoid which does not stimulate uterine growth, causes only slight hyperemia and stops bleeding. Fellner describes a characteristic lipoid as the active principle

of the ovaries. He is doubtful if an internal secretion of the ovary has anything to do with bleeding. Only when the ovary has prepared the mucosa for pregnancy can other associated chemical substances normally result in menstruation. In other words, the ovaries *initiate* the processes leading to menstruation. He has obtained a characteristic lipoid which by subcutaneous injections in animals causes enlargement of the uterus, pregnancy changes in the endometrium, enlargement of the vagina, decided growth of the mammæ (also in males) but does not stimulate bleeding.

Fellner's sexual lipoid is said to come from the interstitial cells and is the same as in the placenta.

The purpose of the follicle is ovulation; the purpose of the corpus luteum is aid to nidation.

Before puberty, the interstitial tissue and the cells of the quiescent follicles exert an influence on development, on the secondary sex characteristics, on the shape of the pelvis, and the growth of bone.

The ovary contains and produces substances which act differently from the cells of Leydig. There are however Leydig components in every ovary, but these are covered by the specific elements which determine the secondary female sex characteristics.

Certain elements of the ovaries cause such an interrelation between the endocrine glands that processes initiated in the male by the cells of Leydig, are absent.

That certain male characteristics, such as shape of the pelvis, hair on the face, character, voice, psychic manifestations do occur in some women, and that suggestions of it are apparent in many women at and after the menopause, show that either the female specific qualities in the ovaries and other glands are below normal, or that excessive Leydig components are present in the ovaries.

The mature ovary contains ova, primordial follicles, atretic follicles, maturing follicles, corpora lutea, corpora albicantia, interstitial tissue, and Leydig components. Columns of cells of the corpus luteum are not unlike those of the cortex adrenal.

The corpus luteum comes from the epithelial cells of the Graafian follicle and the inner theca.

The corpus luteum is said to be a source of cholesterin; it is said to be a galactogue, to produce hyperemia of the genitalia, inhibit ovulation, prevent ovulation during pregnancy, aid nidation, protect the growth of the ovum. It sensitizes the endometrium and makes it react by overgrowth into deciduoma in association with the mechanical and enzyme stimulation of the impregnated ovum.

In therapeutic application, it is found that corpus luteum as a rule delays or diminishes menstruation, whereas the whole ovarian extract quite often, and ovarian residue still more frequently, increase menstruation or advance its onset. In other words we have two antagonistic secretions in the ovary.

When the ovaries begin to produce the accepted adult type of secretion, the result is made apparent by the onset of menstruation. But they certainly are functionating before this period of puberty, and thus they may be responsible for some of those skeletal differences between the female and male type, such as the difference in the form of the pelvis. The ovaries are responsible for the proper development and nutrition of the external and internal genitalia. Their main protective influence is exerted upon the uterus, and more particularly upon its lining, the endometrium. Diseases occurring in infants and children, which produce changes of an injurious nature in the ovaries of a permanent character, result in the various degrees of underdevelopment of the genitalia. Removal of the ovaries results in a cessation of menstruation, and the absence of the trophic effect of their secretion upon the uterus is evidenced by its atrophy. Experiments made on animals have proved beyond doubt that removal of the ovaries in the newly born results in failure of development of the genitalia and of the breasts. Removal of the ovaries after development of the genitalia and the breasts produces regressive changes in these organs, especially in the uterus. If, however, these ovaries when removed from their normal site are transplanted elsewhere in the abdomen or in the abdominal wall, and establish a new connection in these areas, no regressive changes occur in the genitalia and

in the breasts. It is a fact, then, that the ovaries, so long as they are "alive," no matter where they are situated, exert this trophic and protective influence upon the uterus and the genitalia, through the medium of the circulation and by virtue of an internal secretion or secretions.

The distinction between the genitalia of the two sexes themselves constitutes the "primary sex characteristic," but a number of differences which are not connected with propagation, but which are characteristic of the being of the female, are called "secondary sex characteristics." Among these are the greater tendency to fat under the skin, and the resulting rounding of the body, the width of the hips, the marked development of the gluteal region, the length of the hair, the absence of beard, the difference in the larynx. The difference in the pelvis is very marked. There is a slighter development in the features of the face, especially the lower jaw. The brain is smaller. Psychically, even as children, there is a taste for different forms of play. The differences are already apparent between the ages of eleven and fourteen as concerns the rounding of the features, the increase in the fat, especially in the mammæ, in the gluteal region, on the thighs, etc. The most important of the secondary sexual characteristics are the breasts.

A remarkable development of the mammary glands take place at puberty. This development is influenced by the ovary. The mammary gland assumes the part of a secondary characteristic of the female sex, attaining to complete development under the influence of the ripening ovary. (The hypertrophy which takes place in pregnancy is not due to the ovary but to the trophoblast.) The real maternal function of the gland is developed by a secretion from the placenta, which promotes hyperplasia. The subsequent suppression of this placental secretion permits the onset of the secretory function.

The interrelation between the hypophysis and ovaries is extremely close. In the ovary there are four glandular elements:

(1) The follicles, concerned with the production of ova, liquor folliculi, and the processes leading to menstruation.

(2) The corpus luteum, designed to inhibit menstruation and to aid the nidation of the ovum.

(3) The corpus luteum of pregnancy, brought into existence by the reaction produced by placental ferments.

(4) The interstitial cell-body.

These interstitial cells are probably related to the acquirement of the secondary sexual characteristics. The reproductive functions covered by the follicles may not be impaired, even though complete secondary sexual characteristics have not appeared. The element of the ovary which is responsible for the constitutional physical changes which characterize puberty is probably the interstitial cell structure. As a consequence of preadolescent castration some of the acquired characteristics of sex fail to appear. Other cases show imperfectly acquired secondary sexual characteristics when hypophyseal lesions antedate puberty, and a resultant amenorrhea with retrogressive sexual changes when the malady develops after adolescence (Cushing).

Hypersecretion or hyposecretion of the hypophysis, cause other changes than those related to the acquirement of adolescent characteristics. Thus, amenorrhea may be an early symptom with hypersecretion or hyposecretion of the hypophysis.

It must be remembered that the ripe ovary is filled with thousands of follicles in a quiescent state, and that at regular intervals at least one follicle develops, becomes larger, is filled with fluid, approaches the surface of the ovary, breaks through the ovarian covering, and throws out its liquor folliculi and the tiny ovum. It may be assumed that this follicle, with its contained fluid and ovum, represents either an added amount of ovarian secretion or a new form of ovarian secretion. If no pregnancy takes place, this corpus luteum becomes smaller, and finally ends in a form of scar tissue. If pregnancy does occur, it develops into a progressively growing structure, known as a true corpus luteum. Why, in the first instance, does the follicle become a scar within a short time and, in the second instance, why does it remain as a living functionating structure for several months? As the corpus luteum, it undoubtedly has a

function. The explanation which we wish to make at the present moment is that the presence of the fecundated ovum within the uterus and the trophoblast secretion which it throws into maternal circulation so stimulate the ovary (as it also stimulates other glands) that the ruptured follicle reacts by a progressive change in its lining, and continues as a living, functionating part of the ovary instead of quickly ending its follicle function by becoming a healed area.

We know little about the secretion of the follicles, yet they probably nourish the uterine lining. It is probable that subsequent ovulation in pregnancy is interfered with by the corpus luteum, so that pregnancy may not be interrupted. The integrity of the uterus depends on the secretory function of the follicles, and they produce the impulse of nutrition in the uterus, which, together with the cyclic phenomena of premenstrual and menstrual congestion and together with painless contractions stimulated by the posterior pituitary, prevent the uterus from undergoing atrophy. How much the hypophysis may have to do with these painless contractions is no longer a matter of conjecture. The ovary, especially the corpus luteum, produces a hormone, which, in association with the cyclic processes, promotes decidual cell growth.

The secretion of the interstitial part is not definitely known. It may be related to the vasomotor apparatus, although the administration of lutein sometimes corrects these annoyances when due to climacteric changes. Biedl thinks that the interstitial gland controls the cyclic changes in the genital canal. There is certainly an antagonism between the corpus luteum on the one hand and the follicles and the interstitial gland on the other. Alterations in other glands probably do not affect these two elements in the same way or to the same degree. Diseases or alterations of the ovary, as yet unrecognized, probably involve the follicle apparatus and the interstitial gland in a different way and to a different degree, so that there may be hyperfunction, or hypofunction, or either, in various combinations.

The ovarian secretion is responsible for menstruation. It is responsible for it in the following manner—it has a constitu-

tional action on various mucous and serous membranes of the body, but has a special cumulative, selective, periodic, congestive influence upon the uterus, whereby the uterus becomes filled with blood, the capillaries become dilated, the endometrium is stimulated to hyperplasia, becoming thicker and turgid, the interstitial cells becoming larger and hexagonal in form, so that the uterus, and particularly its lining, becomes a nest ready for any ovum which may settle within its cavity. This is a wonderful provision of nature to furnish a thick, hyperplastic, moss-like lining, on which and in which the fecundated ovum may embed itself. This provision is wise for two reasons—first, it gives plenty of blood to serve as nutrition for the ovum, and second, it makes a thick lining into which the egg may settle. It must be mentioned, at this point, that the ovum is, strictly speaking, a parasite, which, by the very nature of the growth of its outer layer into trophoblast cells and chorionic villi, has a decided tendency to grow deeply through the uterine lining into the uterine wall. Here comes the added influence of the corpus luteum. This added factor further stimulates the uterine lining, making it a still thicker membrane, and in this way furnishing a favorable area into which the egg and its covering cells may penetrate, and, at the same time, by the very thickness of this membrane, protects the uterine wall from invasion.

The first decidual changes in the uterus are produced by the ovaries. It is true that removal of the ovaries in pregnancy causes no marked change, for, in spite of double castration, pregnancy may take a normal course and so may the subsequent milk formation. It seems, therefore, that the ovaries trophically take care of the uterus and of the endometrium, prepare the endometrium for the nidation of the ovum, and then give way to other secretions. One ovary contains a corpus luteum, and, on theoretic grounds, it would seem that this is a secretion which in the first months should continue to protect the uterus, endometrium, and other body tissues against the local and systemic invasion of the chorionic villi and placenta. This may indeed be true, and, after double castration in pregnancy, either this ovarian secretion or corpus luteum secretion remains as a

ferment, and thus continues its activity, or else some other gland structures (future placenta) take up the function which the corpus luteum supposedly performs.

During pregnancy changes occur in various of the gland structures of the body. A decided change takes place in the secretory activity of the hypophysis, structural changes occur which last for months, so that the gland never goes back to its former antepregnant state. Quite frequently during pregnancy an evident stimulation of growth, slightly resembling acromegaly, brings the participation of the hypophysis to our notice. Since the introduction of pituitrin, with its ofttimes magic effect in stimulating and accentuating labor pains, we have proof again that the hypophysis is concerned in various ways in the processes of pregnancy and labor. The introduction into the body economy of the placental element, which constitutes a secretion, has beyond doubt its effect upon various gland structures of the body, and it is quite possible that this secretion is responsible for the true corpus luteum and for the maximum decidual reaction, either by direct influence on the uterus or indirectly through the corpus luteum.

It is not to be understood that only the thickness of the decidua protects this lining and the uterine wall from penetration by the villi; other factors enter into consideration; namely, certain elements or enzymes in the blood and in the decidua, which exert a delimiting effect on those cells that grow out from the ovum, and which so alter the character and penetrating power of these same trophoblast cells as to in this way also protect the uterine wall from their too deep growth. It must not be overlooked that these very trophoblast cells, which grow into the decidua, are at all times being absorbed and thrown into the blood current, where they circulate, become dissolved, and constitute what we have called the *placental secretion*, a secretion which exerts an influence on the mother from the very first moment that a fecundated ovum embeds itself; in fact, the only satisfactory explanation for the cessation of menstruation when pregnancy occurs is furnished by the fact that a placental secretion exists. This secretion, when absorbed, acts as an antagonist to that part of the ovarian secretion which

causes menstruation. It has already been stated that the ovarian secretion produces the congestion and hyperemia in the premenstrual few days. This congestion and hyperemia rises to such a high pitch that diapedesis and rhexis occur in the capillaries of the endometrium, which relieves the tension in that tissue, the consequent loss of blood constituting the phase known as menstruation. It can be readily understood that an overstimulation on the part of the ovarian secretion may be responsible in this way for a too profuse flow of blood. The character of the blood itself, or a lack of a proper coagulating ferment, or an abnormal character of the capillaries, may be responsible for a too profuse flow of blood. An abnormal type of endometrium, such as is commonly called "fungoid," or the existence of a diffuse or localized polypoid form of mucous membrane, may result from overstimulation by ovarian hormones, and may be readily responsible for an excessive flow of blood. A uterus which does not contract well and which, because of rhythmic repeated contractions of insufficiently effectual power, does not hasten the approach of the relative anemia of the postmenstrual period, will naturally be responsible for a too excessive flow or a too protracted flow of blood. In other words, if a uterus is normal, if its lining is normal, and if the blood is normal, such a uterus is able to resist the hyperemic congestive influence of the ovarian secretion for a certain period only. That period follows in the human being, as a rule, the type of twenty-eight days. If this secretion is too powerful in its effect, or if the blood or the lining of the uterus are abnormal, then the capillaries cannot resist this congestive influence for the period of twenty-eight days, and menstruation occurs too early or else too long. On the other hand, the ovarian secretion may be of such a diminished energy or power that it is unable in an interval of only twenty-eight days to produce sufficient tension or change in the capillaries as to have them break and allow a flow of blood; or the endometrium or the capillaries may be so constituted or altered that they resist this power of the ovaries, and for either of these reasons the menstrual interval is prolonged to five weeks, six weeks, two months, or ofttimes longer, regularly or irregularly.

This does not of necessity affect the power of the ovary to produce ova capable of fecundation. When the ovarian enzyme, or enzymes, are producing this congestion in uterus, and bringing on such a turgid condition of the endometrium as to presuppose the relief of this state by the outflow of blood, if at this time a fecundated ovum throws its own particular enzyme into the circulation, it either nullifies this particular phase of the ovarian secretions' activities or else it locally, or through the blood, affects or alters the capillaries, and by either of these two processes the outflow of blood is inhibited. It may be then taken for granted that during the early months of pregnancy it is the particular function of the ovarian secretion, with the newly added power of the true corpus luteum, to trophically nourish and stimulate the uterine lining and the uterine wall, and to thus protect it against the local activities of the ovum. We have a right to presume that the ovarian secretion, together with the added secretion of the true corpus luteum, has a constitutional influence whereby its enzyme power is exerted in conjunction with secretion which the ovum, through the growth of its outer layers, is continually throwing into the body. In other words, we may with reason express the conviction that the ovaries are among the glands which aid the mother in her fight against the local activities of the parasitic ovum and its trophoblast cells.

We know that the development of the genital glands is influenced by several of internal secretory organs. Early and exceptional development of the body and genital glands may be the result of tumors occurring in the suprarenals, in the pituitary glands, or the pineal gland. Hypophyseal affections tend, as a general rule, to genital atrophy.

The effect of late genital maturity, like that of genital hypoplasia, is to increase the height, especially the length of the legs, while early genital maturity causes premature closing of the epiphyses and is associated with short legs. The relationship between the ovaries and those other secretory organs which influence the growth of bone is remarkable. Castration is followed by changes in the thyroid, thymus, and hypophysis. Removal of the ovaries causes an increase of the hypophysis.

Certain changes in pregnancy resembling acromegaly are due to primary hypofunction of the ovaries and secondary hyperfunction of the hypophysis, since, during pregnancy, ovarian activity is in a way inhibited. Senile decay is associated with regressive changes in the internal secretory glands, especially the thyroid.

After castration metabolism is much reduced. The diminished metabolism may be raised 120 per cent. by ovarian extract. The increase in metabolism is due to the changes in substances which do not contain nitrogen. There is a relationship between the ovaries and the suprarenal cortex. The principal rôle in osteomalacia, too, is played by the ovaries. The ovaries have always been considered as a factor in chlorosis, either through hyperfunction or malfunction. Wallart thinks there is a relationship between the interstitial ovarian secretion and the formation of blood.

Castration never produces the positive characteristics of the opposite sex, but results in a certain fixation of an infantile type. Early castration is followed by excessive longitudinal growth, a lack of proportion between the length of the trunk and that of the extremities.

It seems that after castration the body length is greater. The sella turcica is then increased, as an expression of the enlargement of the hypophysis. Removal of the ovaries causes a great atrophy of the uterus, has a little effect on the vagina, and almost none on the external genitalia. In individuals castrated during the early years the instinct of sexual desire does not exist unless there has been a preceding somatic psychic-sexual puberty. Has there once been an awakening of the sexual desire, or an actual experience of it, then the memory pictures obtained thereby (the so-called libido centralis) work against the disappearance of the "Geschlechtstrieb" after castration. For this reason the majority of cases of castration find little difference in libido.

Puberty is a critical period for the growing girl. The ovary begins to manifest the power which it is to exert for many years. It exerts its function to a heightened degree locally in the pelvis; it exerts its function probably through psychic channels; and

it, in all probability, so stimulates other glandular functions that the organism of the girl adapts itself to these new influences with variations, from that of a simple adjustment, up through the various degrees of temporary maladjustment to the highest degree of temporary or protracted maladjustment. In this connection, we must pay attention most particularly to the element of the thyroid secretion. When the ovary begins to assume its full active position in the economy of the growing girl, changes of a marked nature occur with a certain degree of regularity. We must credit the impulse for these changes to the secretion produced by the ovaries. By cumulative action, a gradual congestion and hyperemia and a stimulation or irritation is produced in many portions of the body at intervals of twenty-eight days. Before and during menstruation the vocal chords become hyperemic; the same occurs in the mucous membrane of the stomach and intestines and in the mucous membrane of the nose. There is a tendency to irritability in the central nervous system, the breasts become full and sensitive, there is a feeling of weight in the pelvis. These symptoms, and other annoyances of a still greater degree, in many instances precede the onset of menstruation, and represent the highest point of the premenstrual wave, the symptoms persisting more or less during menstruation and then gradually ebbing away. Some patients are almost unaware, so far as constitutional manifestations are concerned, of the onset of menstruation, while others can foretell this period by one or more of these prodromal symptoms. So far as the irritability of the nervous system is concerned, the degree to which the individual reacts to the premenstrual and menstrual stimulus is an index of the stability of the nervous system. It is not so much the fact that ovarian secretion of different strengths effects these different degrees of irritability, etc., as it is that organisms and nervous systems of different grades of resistance react differently. A question of importance concerns the probability of secretions, other than the ovarian, as probable factors in the production of some of these annoyances.

Many girls enter into the menstrual phase, irregularly or regularly, with few, if any, constitutional annoyances. Some go

on in this placid way during a greater or the entire portion of their lives, unless some intercurrent condition alters this smooth progress. Others at some subsequent period acquire varying degrees of constitutional phenomena in association with the premenstrual and menstrual phases. In some instances puberty has associated with it symptoms of an annoying character, which may disappear after a certain period of time, or which may persist or grow worse at a later period. At puberty there is a tendency to cardiac irregularity, shortness of breath, and symptoms of a nervous nature, which may be due to the inability of the system to adjust itself calmly to the ovarian secretion, or it may be due to the fact that the ovaries, which are to be viewed as closely related to the thyroid glands, so stimulate the thyroid that it acts irregularly, often with too great force, and, therefore, though in varying degrees, the individual is really suffering from hyperthyroidism. In some cases the ovarian secretion is constantly stimulating the thyroid; in other instances, it may do so only before each menstrual period; in still other instances, it may do so at irregular intervals. It may be seen from these statements that either secretion may stimulate the other gland, or may influence the other by its own superior power. In other words, the ovaries may secrete too little. If the thyroid secretion does not preserve an equal ratio, then there is, relatively speaking, too much thyroid in the body. There may, on the other hand, be too much thyroid secreted, and this may so antagonize the secretion of the ovaries that their function is not properly carried out. The ovaries may be secreting too much, and this excess of secretion may either overstimulate the thyroid gland or may antagonize, and, to a certain degree, inhibit the thyroid gland's function. In some instances there may be too much secreted by both thyroid and ovary; in other instances they may each be secreting entirely too little. In this way there may be produced a variety of symptoms, either before or during menstruation, or at certain regular or irregular intervals, or more or less continuously. What part the hypophysis may play in the production of these relations, or what part it may play in association with these two secretions, will be discussed

on another page. It is of interest to recall a few facts concerning the thyroid gland. The thyroid gland has an important function in women, and it is abnormally altered in them much more frequently than in men. Myxedema and Graves' disease are far more frequent in women than in men. The thyroid gland seems to swell before menstruation; during pregnancy, before and during labor. The frequent tendency to irritability of the nervous system during these periods is to be traced to the relation between the ovarian and thyroid secretion, which practically at these times constitutes a hyperthyroidism. On the other hand, there are actual periods of hypothyroidism, associated with which there may be a coincident diminution of the ovarian function, or the ovarian function may be actually or relatively increased, and it is possible that in certain cases actual hyperfunction on the part of the ovaries may be responsible for a relative hypofunction of the thyroid. It may be readily seen that this play of the two secretions, altered as their relation must necessarily be during the various phases through which womankind goes, renders instability of the nervous system quite frequent. It is this condition which aids materially in making womankind the weaker sex, and not until the menopause comes on, and not until the ovarian secretion and the thyroid finally assume a quiescent and not continually changing relationship, do thousands of women find that peace of bodily, nervous, and mental function to which we give the name of good health. When, to these various alterations, there is added the function of the breasts and the influence which lactation or the absence of lactation exert we have another factor which increases the instability of which mention has been made.

Development of the breasts depends to a great extent on the trophic stimulation of the ovaries. They develop markedly before puberty. In the climacterium there is a progressive atrophy of the mammæ. The relation between the two, mamma and genitalia, is not through nerve channels. Hypoplasia of the mamma occurs in the young after castration and may be avoided by ovarian transplantation. The pregnancy changes in the mamma are due to some new internal secretion.

The development of the breasts before puberty, their rapid growth at that period, their swelling before menstruation, their atrophy at the menopause, are dependent on the secretion of the ovaries. What new secretion prompts the marked hypertrophy during pregnancy and the secretion of milk after labor? Both these alterations take place even if the ovaries have been removed early in pregnancy. According to Halban, the placenta during pregnancy assumes some of the functions of the ovary, the activity of the latter being supposedly inhibited during this state. After labor, when the placental secretion is no longer to be considered, a puerperal involution takes place in the mamma and milk is secreted. It has often been noticed that the secretion in the breasts during pregnancy changes to milk when the fetus dies; hence, cessation of function on the part of the placenta seems to be necessary to starting the secretion of milk. On the other hand, injection of placental extract increases the milk secretion in nursing animals and rouses a secretion which has nearly stopped. According to Halban, ovarian secretion and the placental secretion have analogous functions. From the theoretic standpoint, it always seemed to me that the ovary and trophoblast are in part antagonistic, and that the ovary is one of the glands which protects the uterus from too deep inroads on the part of the trophoblast cells. At any rate, the ovaries, when they again come into function after labor, are able to produce in the breasts the secretion of milk after the system has taken up or been acted upon by secretion of the placenta. In other words, the ovaries take trophic care of the breasts; when placental secretion is added to the circulation some preparatory change takes place in the mammæ which is essential to milk formation. Milk formation then takes place only when this placental secretion is removed as an active factor. Then, it seems the ovaries aid in establishing the flow of milk, though this occurs even when the ovaries have been removed. What relation the thyroid bears to milk formation is not known. We do, from practical experience, realize that small doses of thyroid extract stimulate the breasts to increased function, but this is probably

only another evidence of the great importance of the thyroid in the metabolism of the body.

In climacteric uterine atrophy there are usually anatomic or clinical evidences of a hypofunction of the ovaries. The absence of molimina menstrualia speaks for like processes in both the ovaries and uterus. Senile involution and lactation atrophy are in a degree physiologic. Thorn believes that stimuli which pass out from the mammæ are the cause of uterine contractions which result in atrophy. Lactation atrophy is probably a result of a temporary cessation of function on the part of the ovaries, or is due to a diversion of their trophic influence to the breasts, in this way depriving the uterus of its regular stimulation. In lactation atrophy vasomotor annoyances, such as are seen after castration, are not evident. Some ovarian activity perhaps persists, or else that part of the ovary which protects these functions is intact, and there is a disturbance of the follicle or interstitial secretion, thus resulting in amenorrhea.

Ovarian dysfunction at puberty is either primary, due to developmental changes, or secondary, due to intraglandular anomalies. In the latter, we must look particularly to the pituitary and the thyroid. Believing firmly that adolescent and puberty nervous manifestations are often traceable to interglandular mal-relationships some of the adult manifestations are noted in the hope that attention may be attracted to like symptoms in the young.

Neuroses Connected with Ovarian Atrophy.—Mental irritability is the most distressing symptom; the sense of apprehension, inability to control the temper, restlessness, states of depression, defects of judgment and memory, lack of self-control, are frequent symptoms; intense headache, pain in the back of the head and neck, sudden flushes, sensations of pressure in the head, irregular digestion, irritability of the bladder, pains in the muscles.

These symptoms seem to be periodically increased after the menopause, at a time coincident with what should be the normal period, but are more or less present for two years after suppression of the function of the ovaries. Many of the symptoms appearing at the menopause are suggestive of the

hypersecretion of the thyroid, as they are similar to symptoms occurring in Graves' disease, but they are not wholly due to such a hypersecretion, as is proven by the fact that administration of lutein or of ovarian extract causes marked improvement.

The relation of thyroid and ovaries is shown by the swelling of the thyroid during the first weeks of married life. When the ovaries cease to perform their functions, there may be (1) a hypersecretion of the thyroid leading to the sense of deep flushes, rapid pulse, and mental irritability; or there may be (2) cessation of the thyroid, leading to an accumulation of fat, a sluggish state of metabolism, and depression and partial dementia; the first form is treated by the use of lutein for weeks, the latter by the use of thyroid for a long period (Starr).

Neurotic Symptoms Dependent on Hypophysis Disturbances.—There are mental changes, such as lack of ambition, indifference to matters of importance, inability to do ordinary work, and a state of mind such as seen with chronic opium habit. The extreme forms are easily recognized. In so-called neurasthenics many minor conditions are probably due to disturbances of this gland. There is also a type of neurasthenic who is fat, gaining in weight, has a lack of ambition, craving for sweets, and in all probability some of the nervous manifestations are due to the hypophysis. In two or three such cases of marked headache, the use of pituitary extract has caused relief and has improved many of the nervous symptoms. These cases may also be improved by thyroid extract, which acts very much like hypophysis Starr gives one or two grains a day for ten days, then an intermission of five days, and then again.

In myxedema, patients are depressed almost to the verge of melancholy without the self-accusation and despair of true melancholia. They are sluggish in their thought, unable to remember recent events, indifferent to their surroundings, without interest in personal and family affairs. They take an unfavorable view of their own condition, their will-power is impaired. There is a mental inertia, they are inclined to be sleepy, and often sleep heavily, both day and night, and awake without any sense of refreshment.

Physically there is a dryness of the skin and hair; the skin does not perspire, it becomes pigmented; the hair falls out or becomes gray. The surface of the body is cold, the hands and feet are always cold. Appetite and digestion are impaired. There is an interference with the calcium metabolism. There is a progressive gain in weight. There may be constant pain in the muscles and bones. Levi, of Paris, says that in many cases of chronic rheumatism thyroid treatment is the best. When nervous or neurasthenic patients complain of such symptoms, one grain of thyroid twice a day, added to the other treatment, is of value. In ten days the effect should be evident in less dryness of the skin, in relief from the sensation of cold, and in the decided improvement in mental activity.

Mental sluggishness in young girls, with symptoms resembling dementia præcox, and considered as cases of weak-mindedness, may obtain mental activity by thyroid. The symptoms are not enough to warrant the diagnosis of myxedema, but the dry scaly skin, dryness of the hair, and coldness of the body suggest thyroid extract (Starr).

Ovarin.—It seems strange that after all the tremendous amount of experimental work which has been done, and after all of the verification which physiologic and pathologic investigations have given in the pursuit of this topic, there should still be those who doubt the existence of an ovarian secretion. They readily grant the tremendous importance of the thyroid and the suprarenal structures, and are now beginning to recognize the important rôle of the hypophysis. Recognition of the importance of the thyroid and adrenal apparatus was probably furthered by the therapeutic results obtained by the secretions of these glands, used experimentally or medically. The fact that up to date no ovarian secretion has been produced, which produces in the same short space of time marked or noticeable effects, possibly accounts in a measure for the failure to grant to the ovaries the place they deserve as most important factors in the female economy, aside from their very important function of producing ova. At almost all periods of life the thyroid, and the suprarenals especially, are intimately concerned with the vital daily processes to a greater or lesser

degree. Whereas the ovary exerts its influence over a very extended period of time in channels and ways which show no decided alterations, but only gradual but lasting phenomena, it must be granted by everyone that removal of the ovaries in young animals or young human beings stops complete development of the mammary gland and of the external and internal genitalia, especially the uterus. In adult women, removal of the ovaries is followed by atrophy of the internal genitalia, most particularly the uterus. At the climacterium regressive changes in the ovaries are followed by atrophy of the genitalia. These factors are universally known, and they are generally recognized as resulting through the failure of a secretion produced by the ovaries. The ovary has a remarkable effect, too, in influencing the form of bony growths in the female. It produces the female type of pelvis; it has to do with the degree and extent of skeletal growth. It is intimately concerned with the changes produced in osteomalacia. It has an intimate relationship with the thyroid, the thymus, and the hypophysis, glands which are extremely important in the processes of bony growth and of ossification. The alterations produced in the ovary in acromegaly are so decided that, in the minds of many observers, they are the primary factors in the production of this disease. The same holds true in the cases of giants and dwarfs. All these, and innumerable other points, which I have previously mentioned, prove the great importance which the ovaries bear in the general economy; however, to be sure, scarcely vital. The most important, and, in my mind, extremely important, relationship in women exists between the ovary and the thyroid. Many years ago my attention was attracted in this direction by the observation that, in many cases of ovarian hypofunction in young women, there were symptoms of a digestive and general nervous nature that implied a toxic irritation by some other secretion. The study of the changes produced at puberty, before menstruation, before and during the climacterium, taught me that in innumerable cases we were dealing with actual or relative hyperthyroidism, and I gave to that class of patients, in whom an excess of thyroid was due to hypofunction of the normally antagonizing

ovarian secretion, the name of relative Basedow's disease. Many of these cases manifested their annoyances in association with menstruation—that is, usually in the premenstrual phase—and it is important in this type, of what might be called constitutional dysmenorrhea, to distinguish between the cases due to overactivity of the ovarian secretion itself, due to its being in excess, so to speak, and the type where the annoyances are due to ovarian stimulation, producing an excess of thyroid secretion. In other words, we may distinguish three types: (1) The annoyances are due to too much ovarian secretion; (2) there is normal stimulation, by either ovarian or thyroid secretion in a patient with an extremely hypersensitive organism; (3) there is real hyperthyroidism.

The diagnosis between the annoyances due to excessive ovarian stimulation on the one hand, and hyperthyroidism stimulated by the ovarian secretion, may be in many instances readily made by the use of ovarian extract and of thyroid extract. Any patient suffering from this premenstrual dysmenorrhea of a constitutional type due to hyperthyroidism is made distinctly worse by the use of thyroid extract, ¼ to 1 gr. three times a day. Any patient whose premenstrual annoyance is due to the presence in the blood of an excess of the ovarian hormone is benefited by the exhibition of thyroid extract. In this type of case, and in cases of a nervous nature, at whatever age or stage, I have for years made use of the thyroid extract for diagnostic purposes, and have unearthed thereby many cases of relative and actual hyperthyroidism, and have seen several of these patients subsequently develop distinct signs which absolutely verified the diagnosis. In my experience, ovarian extract is a valuable drug. Lutein extract has also given me good results, but by no means more distinct. I find that ovarian extract is of great value in the minor degrees of hyperthyroidism, especially the forms depending on hypofunction of the ovaries. It is a very valuable drug in lactation atrophy of the uterus. It has given me for years very good results in the flashes of the climacterium, especially when begun early. If begun shortly after operation, there are few cases of castration who suffer very much from the so-called flashes. In

the few cases of chlorosis which have come under my observation, and in the many cases of anemia, it has served me very well. I learned many years ago to combine iron and arsenic with ovarian extract in almost every indicated case, especially where the hemoglobin was reduced, and, on the other hand, in cases of anemia, where the iron was the primary indication, I almost invariably added ovarian extract. So that to-day I have adopted the rule when you give iron also give ovarin; when you give ovarin also give iron. I find that each accentuates the action of the other. In amenorrhea, relative or absolute, it has been my standby for years. The type in which least influence on the amenorrhea is obtained is the precocious menopause of obesity, which I am now beginning to consider in many cases as a dystrophia adiposogenitalis, dependent on some disturbance in which the hypophysis plays an important part. Ovarian extract is a drug which must be used for a long time, and one which must be judiciously combined with other drugs. It produces no annoyances, and the main contraindication consists of profuse bleedings. I have, in many instances, combined ovarian extract with thyroid, especially to promote metabolism and encourage oxidation. The annoying symptoms produced by thyroid extract are often surprisingly diminished by adding ovarian extract. For therapeutic purposes I have learned to give small doses of thyroid extract, $\frac{1}{6}$ gr. three times a day, often producing splendid results. For diagnostic purposes I give larger doses, as much as $\frac{1}{2}$ gr. i three times a day.

THE PLACENTAL AND MAMMARY GLANDS

The development of the secondary sex characteristics depends upon the ovaries through the co-operation of the other glands and by action of the other glands themselves. The development of the mammary glands is especially controlled by the action of the ovary. No matter how well the other glands function, if the ovaries are removed in the early years a failure of development of the internal genitalia, the mammæ, and the secondary sex characteristics occurs; and if this occurs after puberty then atrophy of these various organs takes place, most

particularly, however, in the sphere of the genital tract. Our attention is thus fixed on the value of the secretion developed by the ovary, by the interstitial structure, by the follicles themselves, and by that substance known as the true corpus luteum which begins to develop before menstruation and continues to grow only, under normal conditions, when pregnancy exists.

Now the ovaries are responsible for menstruation through the action of the vegetative nervous system and more so through direct action of the secretions on the uterus, and its lining through the medium of the circulation. That the corpus luteum plays an important trophic part is not to be doubted, but it is also a secretion produced by the ovary.

We know in a general way the action of these various secretory glands and we know more and more each day of their interactivity, and how a failure, in the way of overaction or underaction, on the part of one influences the whole cycle. Now, into this realm of interglandular activity there enters a new phase in pregnancy. When an impregnated ovum comes into the uterus and imbeds itself in the overgrown decidua by enzyme action inherent in itself, menstruation fails to take place. Menstruation is preceded by a tremendous hyperemia of the lining of the uterus, increase in size and thickness of the endometrium, and a dilatation of the capillaries. The secretion of the ovarian tissue tends to diminish the coagulability of the blood, and the glands of the decidua secrete a substance which probably has the same action. Through the action of ovarian secretion, aided by pituitary secretion, capillaries break through rhexis and there is a diapedesis of red blood cells and contractions of the uterus. Only blood is thrown off; the decidua remains behind after menstruation like a wet sponge from which the water has been expressed. These processes are inhibited when a fecundated ovum is in the decidua. *We know that cells given off from the outer layer of an impregnated ovum are thrown into the circulation as soon as it is imbedded.* Slight as this amount must be in the early days of pregnancy it is sufficient through the medium of the circulation, thence reaching the ovary, stimulating the corpus luteum, and acting on the uterine lining and continuing to circulate in the blood, to inhibit

menstruation, though hyperemia and congestion present in the uterine mucosa continue, but rhexis and diapedesis are inhibited. The trophoblast cells of an impregnated ovum are primarily responsible for this.

The next change produced by the trophoblast cells is in the reaction produced in the corpus luteum. This body does not regress as it does when pregnancy does not take place; it simply continues its growth for a period of many months. This continued growth and function of a corpus luteum is undoubtedly a reaction produced by the trophoblast cells. This corpus luteum is important. It continues its nutritional effect upon the uterus and particularly upon the decidua, inhibits menstruation, aids the continued attachment of the ovum and probably exerts a protective influence in preventing too great an encroachment into the decidua and later into the uterus of the trophoblast and syncytial cells.

The nutritional action of the true corpus luteum is of far greater importance in the first months of pregnancy than it is later on for it aids the trophoblast in inhibiting the posterior pituitary. Later on the ovum has developed to a considerable size, a placenta has formed, the entire ovum fills out the cavity of the uterus, and the periphery of the ovum is agglutinated to the entire interior of the uterine cavity. The uterus in these early months grows rapidly, more rapidly than would be expected by the simple stretching effect of the ovum. The ovum hangs by a pedicle in the early weeks and does not by any means fill out the cavity of the uterus. Yet the uterus grows. It does so even in cases of ectopic gestation. Here we see the continued stimulation by the anterior pituitary, adrenal cortex, thyroid, etc., secretions trophic in their nature, and the uterus and the decidua well supplied with blood. The blood contains the secretion of the ovary which would have been expelled and lost had menstruation taken place. Thus the placental secretion plays an important part in stimulating the growth of the uterus.

The next process is the effect of the trophoblast secretion upon the hypophysis gland. The anterior lobe hyperfunctions and the change in its cells is a permanent one. We know what

the anterior lobe does in the process of growth, bone enlargement, and sexual development; and we must consider this and other gland activity as a protective or trophic secretion designed to help the patient herself, probably designed to help the ovum, the uterus, and the decidua in these early months with probably a greater effect on the patient and embryo in the later months.

Hofbauer says that the smooth muscle of the visceral organs; the heart muscle; the endocrine cells; the musculature of the vessels are connected with two systems; (1), the sympathetic, (2), the parasympathetic (divided into cranio-bulbar, vagus, chorda tympani, oculomotor) and sacral (N. pelvicus).

The sympathetic is stimulated by adrenalin and so is the vaso constrictor of the genitalia. The parasympathetic is stimulated by pilocarpine and pituglandol; is paralyzed by atropine and is the vaso dilator of the genitalia.

We know that parasympathetic acts on the motor functions of the uterus. The sympathetic acts on motor functions of the uterus.

These antagonistic actions cause the rhythmic contractions of the uterus.

The tonus and response of the vegetative nervous system is influenced and regulated by endocrines. The secretory activity of the endocrines is in turn regulated by the vegetative nervous system.

The painless contractions of Braxton Hicks are probably due to corpus luteum, but much more to the posterior lobe of the hypophysis, and are a continuation of the automassage ever present in the normal uterus. The increased activity and size of the thyroid, too, and the changes going on in the adrenals and other glands, may be viewed in the light of an increased trophic effect on the genitalia, probably giving off to the patient certain protective substances. The patient in pregnancy needs protective substances because the trophoblast and later placental secretion are entirely new elements and the body must react to it through the medium of the other secretory glands and through the production in the blood of other protective substances, as in fevers and other diseases.

The earliest evidences of the irritating effects of the trophoblast and later placental secretion are to be found in the nausea and vomiting of pregnancy. This new substance is an irritant. It irritates the cerebral centers and antagonizes the posterior pituitary, for this reason having an irritating action on the gastric mucosa, the pylorus, and the liver.

Emesis and hyperemesis of pregnancy resemble parasympathetic irritations. In woman, the emesis reflex is easily roused, as in children. The x-ray shows (in the emesis of pregnancy) increased peristalsis, hypertonia, a rapid play of spastic contractions of certain parts of the stomach wall. This is especially marked in some cases in the prepyloric area. Vomiting is caused by cramp like closure of the pylorus. There is then a change in nerve regulation of the stomach in the sense of an abnormally lively innervation.

Whether the premenstrual hyperemia and congestion which take place in every part of the body and which are associated with dilatation of the cerebral vessels, heightened by the continuous action of the corpus luteum, play a part in this process can only be surmised. At any rate we are justified in considering that the secretion produced by the outer cells of the ovum and later by the placenta is the irritating substance which is primarily responsible for the nausea and vomiting. In whatever degree the body reacts to this and produces the protective endocrine or chemical substances, in that degree is the nausea and vomiting either stopped or continued. If we consider that the corpus luteum of pregnancy is continued as a reaction to this placental secretion, we ought to look upon the corpus luteum as an aid in stopping the nausea. Many observations in this direction have been made and it has been claimed that the injections of corpus luteum extract into these patients stops the nausea and vomiting. Theoretically the idea is splendid and rational; in practice opinions vary. Many are enthusiastic over it. I have not yet had striking success with this procedure, but corpus luteum by mouth and injections of corpus luteum are of value if they succeed in inhibiting the posterior pituitary.

In pregnancy hyperplasia is noted in the thyroid, anterior and middle hypophysis, adrenal cortex, and slightly in the adrenal medulla. These act stimulatively on metabolism and blood formation. The epiphysis and the parathyroid show no changes or only slight changes.

Thus in pregnancy the whole vegetative nervous system is in a state of increased tonus. The thyroid sensitizes the points of action of adrenalin.

Hypophysis potentializes the action of the adrenal hormone on the vessels. Thus the action of adrenalin on the sympathetic nerve ends may be increased in pregnancy, even though it is not increased in amount.

The thyroid calls forth an increased sensitiveness to reaction on the part of the sympathetic. The hypophysis causes the same sensitiveness in the parasympathetic.

Ovarian action is antagonistic to the hypophysis and adrenals and this effect is not overcome by atropin (Schikele). This important observation concerns the action on blood vessels. Ovarian action is antagonistic to the chromaffin system (Adler; Ascher). Hence ovarian extract is of value in hypertonia (Munk).

The hypodermic use of large doses of ovoglandol have caused bradycardia, irregular pulse, increased gastric peristalsis; all of which evidence increased tonus of the vagus, and diminished tonus of the sympathetic.

At any rate, in the vast majority of cases these annoyances in the way of nausea leave permanently at the time that life is felt. In many cases this condition may be excessive, taxing our resources to the utmost, and in some cases pregnancy must be interrupted to avoid permanent or fatal harm to the patient. In these cases the protective substances that are produced by the ovary, the liver, the hypophysis, the *thyroid*, or the system in general, are not produced in sufficient amounts or proper character, and a condition of pernicious nausea and vomiting or early toxemia is present. The transient albuminuria present in some cases in the early months is probably due to the irritating effect of this placental secretion or to hypothyroidism. Overstimulation of the posterior pituitary is, I believe, with

thyroid minus, the basic endocrine factor in the toxemia of pregnancy.

Many patients in pregnancy show quite a growth of the body, a growth sufficiently noticeable to attract attention. The tonic effect is remarkable. Many show at various periods an acromegalic hyperplasia. A transitory thickening of the skin of the face and a suggestion of edema are also decidedly suggestive of a hypophysis change allied to acromegaly. Here we are confronted with the stimulative changes in the anterior lobe of the hypophysis, a reaction undoubtedly produced by the action of the placental secretion.

We next come to the transient glycosuria present in many cases during the various months of pregnancy. It is found intermittently in many cases where routine examinations of the urine are made. This draws attention to the pancreas, to the liver, and to the hypophysis, and possibly to the mammary gland (lactosuria). A transient or even a marked involvement of the pancreas function may occur and there may be a disturbed relation between the thyroid and the pancreas. There may be the liver type of glycosuria. Possibly the mammary gland may have an effect. For the most part we must look to the hypophysis as responsible for this condition. So far, it is known that a more or less marked glycosuria may appear with transient hyperfunction of the hypophysis particularly of the posterior lobe. This factor plus the changes occurring in the anterior lobe speaks for the excessive or increased action of the hypophysis, at least part of it, a reaction probably due directly or indirectly to the placental secretion. That true diabetes may be unfavorably affected by pregnancy, and that it is a most serious condition, is known to everyone.

The *mammary gland* gland is also stimulated in pregnancy. It often reacts to the premenstrual stimulus of the corpus luteum. It increases in size after labor and its secretory functions are finally established after a preliminary hyperemia. Injections of various substances increase the function of the mammary gland. Fetal extract used experimentally stimulates this gland. So does corpus luteum. Placental extract and pitui-

trin will accomplish the same result. The most that may be said is that the mammary gland is acted on during pregnancy probably by the ovary, possibly by the fetus, but most probably by the placental secretion and the posterior pituitary. After labor, when these stimulating factors, though apparently inhibited before, are no longer inhibited by the placenta and a degenerating or secretory process occurs, milk is secreted instead of colostrum. Whether the hypophysis has anything to do with this before or after labor is not known, but some consider the hypophysis secretion a remarkable galactogogue. It is safe to say that no one known substance will positively produce a well functioning breast. Thyroid extract has been used, pituitary extract has been used, placental extract has been used, corpus luteum has been used. I have tried each one of them and am as yet unable to say that any one or a combination of them will, with any degree of certainty, produce milk in every breast. My experience has been that breasts either secrete readily or not, and no régime of food, diet, or tonic treatment will do more than add a stimulus. My later experience has been that a very small percentage of women are able without endocrine aid to nurse their children sufficiently for several months.

It must be kept in mind that the ovum and the placenta are parasites. The nourishment of the fetus taxes the resources of the mother, but this burden in the majority of cases is not an excessive one, if the heart and kidneys are normal. I formerly believed that cardiac diseases could with great care bear the burden of a pregnancy. With increasing experience I am very loath to allow a patient with marked cardiac lesion to be endangered for nine months by pregnancy and labor. It is not the tax on the general system alone. There is something in the ovum and in the placenta which through its action on the other endocrines exerts a markedly injurious action on the heart muscles, on valvular lesions, and on the cardiac centers which encourage and control the rhythm and the force of the beat. In these changes and alterations lie the danger of pregnancy with marked cardiac lesion.

The ovary nourishes the uterus, making it grow, but causes regular bleeding. The placenta nourishes the uterus, making it grow, but stops bleeding. If the corpus luteum acts on the hypophysis posterior lobe and, makes it overact instead of underact at menstruation, we often observe menstrual pain simulating that of labor and called dysmenorrhea. Corpus luteum and the posterior pituitary lobe act as antagonists in menstruation. The placental secretion normally inhibits the posterior lobe as well as does the corpus luteum and no menstruation takes place, only painless contractions.

With an ovum full of atresic follicles and corpus luteum rests ovulation is often inhibited, but the stimulation to the posterior lobe is not present, coagulation takes place slowly or quickly and diminished or excessive menstruation occurs, according to the reaction of the postpituitary, but no ovulation.

It would be wise to try the effect of placental secretion on dysmenorrhea, because of this theoretical inhibition by its action on posterior hypophysis either directly or through the corpus luteum. If placental extract stimulates the anterior lobe of the hypophysis it might be advisable to use this extract in cases where it is desired to stimulate growth in children, with the administration of hypophysis extract also.

If the corpus luteum in any case rouses the posterior lobe of the hypophysis, causing menstrual pain, then corpus luteum is not always indicated in dysmenorrheas.

But if placental extract inhibits the posterior lobe of the hypophysis and holds its contractile influence in abeyance for months, then it might be wise to give placental extract for dysmenorrhea. If ovarian extract and ovarian residue stimulate the uterus and its lining, causing diapedesis and rhexis, and if placental extract results in growth of the uterus but overcomes diapedesis and rhexis, then we should give placental extract in cases where excessive menstruation is due to hyperovarianism. We may thus dissociate the function of the ovary and pituitary as nutritional factors of the uterus, from their function in causing menstrual bleeding. And we must think of the placenta as an organ which directly or through its effect

on corpus luteum nourishes the uterus and its lining but which *overcomes its tendency to bleed.*

Therefore, even if ovarin is contraindicated in menorrhagia, this may be overcome by placental extract. If the decidua stimulates the corpus luteum and this stimulation is lost by menstruation then placental extract by inhibiting menstruation allows the retained decidual secretion to continue its stimulation of the corpus luteum. If we knew just what elements of the decidua or the ovary or the corpus luteum or the pituitary were responsible for the capillary dilatation and increased tension resulting in rhexis and diapedesis, we would find them antagonized by some placental ferment or hormones and by the corpus luteum.

It may be stated that labor represents a crisis in the relation among the glands of internal secretion, particularly the ovary, thyroid, the placenta, and the hypophysis. On the two hundred and eightieth day a magnified menstruation takes place. Placental inhibition is overcome, the ovaries, so to speak, come into their own, and the posterior pituitary gland exhibits an action whose character is exemplified by and intensified by the pituitary extract which we use in obstetrics. If placental hormones antagonize or inhibit the menstrual action of the ovary and pituitary, it is probable that in many cases this inhibition is ineffectual. If this be so this lack of power in the placental hormones may explain repeated abortions (Wassermann negative) occurring at menstrual intervals. This explains the well known liability to abortion at periods four, eight, twelve, etc., weeks after the first skipped menstruation. It also explains the tendency to go ten or more days "over the period" with a then ensuing menstruation. These occasional occurrences in a few of my patients must and may be viewed as *early expulsions of an imbedded ovum whose trophoblast secretion has not inhibited the menstrual stimulus of ovary, and pituitary, and adrenals.*

Pituitrin causes rhythmical contractions of the uterus. The effect wears off quickly, lasting only from half an hour to an hour. This drug is probably excreted quickly in view of its well known action on the kidneys. The amount that can be

given by mouth and by injection even daily is decidedly evanescent in effect. This explains my incomplete results on continuing its use even daily by hypodermic use in cases of menorrhagia or metrorrhagia unless this administration is preceded by a thorough curetting, which temporarily inhibits ovarian function. It compares in no way so far as prolonged contraction is concerned with the effect of mammary extract. The value of ergotol or ernutin by mouth or by hypodermic injection in the postpartum stage is great. If pituitrin is given before labor is completed, it causes powerful contractions of the uterus; it also causes excessive relaxation. This accounts for the occasional bleeding effects postpartum. Hence ernutin, or aseptic ergot by needle or ergotol by mouth, are the best drugs in the postpartum stage, and this may explain why, with its use, postpartum hemorrhage is rarely noticed.

From these considerations we pass on very readily to the theory of eclampsia. Logically we must conclude that placental secretion is the important factor. It does not produce this annoyance in a large proportion of instances because some protective substances are secreted or formed anew. They come from the ovary and corpus luteum, from the thyroid and adrenals, from the hypophysis gland, from the liver, and from other structures in the body not yet recognized as taking part in this protective function. Then come a certain number of cases in which this function is not properly carried out with the result that placental secretion exerts a decidedly irritating influence. Placental secretion is a substance which follows the course of the blood into all the organs of the body, producing changes of a marked character, particularly in certain instances in the liver with marked alterations of metabolism. These changes are of a necrotic nature and of a hemorrhagic type showing the irritating nature of this secretion. If the usual protective substances are lacking, this secretion takes on an irritative, destructive nature. The changes are produced typically in the brain, microscopic in nature, associated occasionally with hemorrhages of a graver type and with edema more or less diffuse and often quite marked and not rarely associated with increased pressure in the spinal canal. Hence

in persistent convulsions and especially in coma, spinal puncture should be tried in all cases.

The kidney annoyances of eclampsia are mainly those due to the excretion through these organs of the irritating placental and altered metabolic substances which irritate the epithelium and produce the albumin and the other changes which are in this type of cases an evidence of a toxemic secretion in the blood. *With a normal or overactive thyroid such a condition is less likely.*

Exudative Diathesis.—Ovarian therapy stops the "vessel cramps" and the increased blood pressure. This therapy is aided by rest in bed, and a salt-poor diet. Large doses by hypodermic work well in eclampsia and overcome increased activity of the hypophysis, increased activity in the adrenals, diminished calcium content of the blood, and renal disturbances. These renal disturbances are an evidence of insufficient blood circulation in the kidney tissue (Hofbauer).

This is evidenced by the rapid alteration between oliguria and polyuria. It is evidenced by the rapid alteration between insufficiency of function and perfect function. It points to bodies having an intimate relation to the vascular system. In this phase it points to the hormone action of the hypophysis and adrenals. Under the action of the hypophysis, the kidney swells and diuresis increases (Froelich).

The adrenals cause an absolute and a percentage diminution of the Chlorwerte (Frey).

Pregnancy seems to be characterized by a form of what might be called Exudative Diathesis. In pregnancy there is often noted increased irritability of the skin vessels (Dermographism), a tendency to slight œdemas, a tendency to œdematous-inflammatory changes (Hofbauer). These are noted in the larynx, lobular bronchi, bladder wall, ureters, appendix, etc. (Possibly asthma is of this type.) The characteristic signs of these typical changes are hyperemia, œdema, cell infiltration. This tendency to Exudative Diathesis is believed by Hofbauer to be of importance in tuberculosis and influenza.

In tuberculosis the connective tissue boundary of a walled off focus or area, may, as a result of œdema yield to a spreading of the process.

In influenza such an exudative process in the lobular-bronchi may lead to pneumonia. This anatomical physiological basis is extremely illuminating in view of the high mortality in pregnant women during the 1918 epidemic. Bronchial asthma in pregnancy is due probably to the irritation of the parasympathetic lung vagus ends.

The dermatoses of pregnancy are characterized by (1), vaso motor influences, (2), exudative tendencies, (3), endocrine action. Irritability of the vaso-motors of the vegetative system stands in close relation to the exudative diathesis.

The increased reaction in pregnancy to body-foreign protein bodies (Eiweissarten) is explained by the increased general over-sensitiveness present in the exudative diathesis. Hofbauer uses large doses, by needle, of ovo-glandol only. This is apparently not corpus luteum. He finds it of great value in impending and habitual abortion.

HYPERGENITALISM (PUBERTAS PRÆCOX)

The somatic and psychic characteristics of puberty are dependent to a great extent upon the maturity of the genital glands.

Premature puberty includes accelerated ossification. Skiagrams show a rapid approach of epiphyseal ossification to the stage when the synarthroses close. This finding is in accordance with that of physiologic puberty, for, in the latter condition, proliferation of the epiphyses soon ceases. Gigantism, on the contrary, is characterized by persistence of epiphyseal synarthroses and by the abnormal height to which this leads (Biedl).

The most important point in regard to the etiology of pubertas præcox is whether or not the condition is primarily the outcome of precocious development of the genital gland. Hypergenitalism and pubertic precocity may be primary or else the secondary results of the primary affection of other glands. This applies to cases in which tumors were present, either in the suprarenals, in the hypophysis, or the pineal glands.

Hypophyseal affections are frequently associated with gigantism, although generally with genital atrophy.

Cases of pineal tumor show abnormal growth in height and premature genital and sexual development and corresponding mental precocity.

The presence of suprarenal tumor in sexual precocity is remarkably frequent. There is exceptional development of the body, obesity, physical precocity, the habit of sexually mature persons, extreme hypertrichosis.

If we exclude these observations, a large number of cases remain which cannot be explained otherwise than by primary hypergenitalism.

The genital glands have a great effect upon the growth of the skeleton. Experiments show that in man as in animals castration is followed by excessive longitudinal growth. A lack of proportion between the length of the extremities and that of the trunk, and persistence of the epiphyseal synarthroses beyond the normal age.

Protracted epiphyseal separation may result, not only from the operative removal of the generative glands, but also from hypoplastic subdevelopment of them. The presence of this symptom, in combination with the persistence of other juvenile traits, is described as immaturity of the organism or eunuchoidia. These cases do not altogether fall into the group of pathologic conditions classed as infantilism, for infantilism is characterized by the small size of the skeleton and its infantile proportions; *i.e.*, long trunk and short extremities. Hypoplasia of the genital gland is presumably accompanied by symptoms analogous to those of suppression; *i.e.*, abnormal longitudinal growth, especially in the legs, and considerable increase in the fat body. Thus, the only true cases of hypogenitalism would be those of infantile gigantism, which are characterized by abnormal growth of the long bone, imperfect secondary sex characteristics, and deficient mental development, and in which testicular atrophy and the absence of any signs of pituitary disease justify the assumption of primary hypogenitalism (Biedl).

The age in which genital maturity takes place has a paramount influence upon the growth of the skeleton. The effect of late maturity, like that of genital hypoplasia, is to increase

the height, especially the length of the legs, while early maturity brings about premature closing of the epiphyses, and is consequently associated with shortness of the legs. Inhabitants of warm countries are generally small of stature. These results are to be attributed to early sexual maturity.

There is intimate relationship between the development of the skeleton and the internal secretory activity of the genital glands. The genital glands elaborate a hormone, which stimulates the processes of ossification. Castration is followed by changes in the thyroid, thymus, and hypophysis, and the removal of these organs produces changes in the structure of the genital gland. It is, therefore, very difficult to estimate the extent to which the skeleton is directly influenced by the genital glands, because the thymus, thyroid, and hypophysis all effect the growth of the bone, their combined influence being complicated, in part antagonistic, in part co-operative.

HYPOGENITALISM (SEXUAL INFANTILISM)

Infantilism includes a group of variations which differ very much, but which include various degrees of retardation of development. In addition to that retardation which affects certain organs, or which affects certain systems (such as the osseous system, the cardiovascular system, or the nervous system, or the sexual organs, or which constitutes a general retardation of development), there is the retardation which is functional rather than organic. An arrest of development which affects the mass of the individual may result from various causes, from infections, such as infections of the cardiac or arterial systems. A normal development may be inhibited by transmission of hereditary faults, or by errors of hygiene during infancy and early childhood. Infantilism may result from anemia and chlorosis, from tuberculosis or lues, or from intestinal conditions, as mentioned by Herter.

Infantilism includes alterations in the osseous system, such as slight body development, gracile bone development, deformities of the skull, hypoplasia of the jaw, irregular tooth development, and the various degrees of skeletal undergrowth. There results delicacy, smallness of the body, and the individual is an adult in small mold.

Infantilism has been considered an anomaly of development, in which the general morphologic characteristics belonging to infancy persist in a subject who has passed the age of puberty. Thus infantilism formerly signified a persistence of infantile characteristics. This view included other elements in addition to stature, and to the element of skeletal undergrowth was added variations in the development of the generative organs of the degree of sexual dystrophy.

To-day we are inclined to consider under infantilism a retardation of development that may begin at any age, and results in the persistence of the physical characteristics that exists at the age of its onset. It means that development remains *stationary* at a stage which a normal individual of the same age has long passed. This unripeness, just as it may affect the entire organism, may also affect only certain organs (infantilismus partialis) or certain organ systems, or else it may affect the entire organism (*infantilismus universalis*). Development of any organ concerns a differentiation in external and internal form, also a change in size, also a change in position, so that an inhibition of growth may concern the form (horseshoe kidney), size (narrow aorta), or position, (undescended testicle-cryptorchism).

Though a retardation of development may manifest itself in a retardation of development of the osseous system or the *nervous system*, or the cardiovascular system or the sexual organs, it does not, by any means, affect all parts equally. Infantilism may also signify retardation in functional development, and this may be general or confined to certain systems, or may be local; hence, asthenia universalis congenita is a functional form of infantilism, so is visceroptosis, so is flat-foot, and so are other forms of asthenia.

Many of the pictures under the heading of Infantilism have been such as resulted from the effects of hypothyroidism.

Thyroid.—Hypothyroidism inhibits the growth, especially of the long bones, associated with which is the tendency to become more stout and plump. There are changes in the growth of hair; there is enlargement of the abdomen, diminution of the temperature, there is a mucoid edema of the subcu-

taneous tissue, atheromatous changes in the aorta; there is genital hypoplasia, sterility, and idiocy. These are observed where, in animals or human beings, there is a complete defect of the thyroid. These changes are especially noted in absence of the thyroids in young animals still in the early periods of growth. In older animals the changes are less marked. The then show apathy, trophic disturbances of the skin, alterations in digestion, loss of weight, anemia, and a disposition to infectious diseases, to which they easily succumb. The genital functions are diminished.

The same changes occur in human beings after removal of the entire thyroids. This is the so-called cachexia-strumipriva. A further symptom of this cachexia is a diminution of the mental energy, of the energy for work, and a typical edematous swelling of the skin. The skin is dry through a diminution of the perspiration, the hair falls out, the patients look old and stupid, the red blood-cells are diminished.

In congenital myxedema there is a decided inhibition of growth. There is obstinate obstipation, psychic disturbances, and a marked inhibiting effect on the sexual organs. In the congenital absence of the thyroid and in the infantile cases of atrophy of the thyroid (which atrophy develops in the fifth and sixth years), the large majority of the cases are found in female children. Myxedema in adults is more frequent than infantile myxedema. At that period 80 per cent. of the cases are in women. Here anomalies in the function of the female genitalia are frequent. Amenorrhea is frequent, but menorrhagia also occurs; in many cases the genitalia remain normal; in other cases a decided *atrophy* is found.

Infantilism may be the result of alterations or deficiency in glandular functions. It may result from the so-called status lymphaticus, where fatty marrow is present instead of red-bone marrow. It may result from persistence of the thymus, insufficiency of the thyroid or faulty secretion of the suprarenals, or pancreatic insufficiency, or deficiency of the hypophysis or ovaries, or chromaffine tissue.

Thymus.—Involution of the thymus coincides normally with adolescence. There may, however, be the so-called persistent

thymus. The thymus exercises an inhibitory influence upon the development of the ovaries, and involution of the thymus is consequent upon the maturity of the sexual glands. Individuals with hypoplastic ovaries retain the thymus longer than normal. In this form of status thymicus there is a question whether the thymus is in direct relation with the genitalia, or whether both are not symptoms of a slow development. In the status thymicus there is a general enlargement of the lymph-glands, of the tonsils, of the follicles at the base of the tongue, enlargement of the spleen, marrow, aorta, and large, pale, soft heart.

If with infantile signs in the body there is genital hypoplasia, with late menstruation, narrow pelvis, large tonsils, possibly slight Basedow symptoms, we must always think of the "status lymphaticus."

Vascular Hypoplasia.—Vascular hypoplasia, with narrow aorta, may be present with or without chlorosis. In vascular hypoplasia anomalies of genital function may occur. Menstruation develops late, there are various forms of dysmenorrhea or amenorrhea, though occasionally there may be bleedings at puberty. When genital and vascular hypoplasia exist in the same individual, they must be considered as co-ordinated results of a general disturbance of development.

Ovaries.—Absence of or alterations in the internal secretion of the ovaries may be the cause of infantilism. The type varies according to the period at which changes occur. Castration of young animals arrests the development of the genital organs; castration of adults changes only the secondary sexual characteristics. Therefore, infantilism may be a regressive change, occurring after atrophy of the ovaries. Atrophy of the ovaries may be secondary to affections of the hypophysis and thyroid. Involvement of the hypophysis causes a typical type of infantilism, with a disappearance of the sexual characteristics. The size of the individual should not lead to wrong conclusions, for early development of the ovaries causes early ossification, and so limits the height of the individual, while absence or late development may delay ossification, and cause increased length of the lower extremities. The secretion of the ovaries assures

the development of the genital organs and the appearance and the continuation of the secondary sexual characteristics, so that congenital or early involvement of the ovaries may prevent the development of the secondary sexual characteristics. The distinction between the genitalia themselves constitutes the "primary sexual characteristic," but a number of differences which are not connected with propagation, but which are characteristic of the being of the female, are called "secondary sexual characteristics," such as greater tendency to fat under the skin and the resulting rounding of the body, the width of the hips, the marked development of the gluteal region, the length of the hair, the absence of beard, the difference in the larynx. The most important of the secondary sexual characteristics are the breasts. The difference in the pelvis is very marked. There is a slighter development of the features of the face, especially the lower jaw. The brain is smaller. Physically, even as children, there is a taste for different forms of play. The difference may be brought under three headings. First, as regards propagation (pelvis, breasts, etc.); second, as connected with the pelvic glands (ovaries), skeleton, larynx; third, variety in inclinations. The differences are already apparent between the ages of eleven and fourteen as concerns the rounding of the features, the increase in the fat, especially in the mammæ, in the gluteal region, on the thighs, etc. (Biedl).

Asthenia Universalis.—Hypoplasia of the ovaries may represent only one of the symptoms of a constitutional anomaly for which it is not responsible. This is not infrequently found as a part of a *general condition* in patients who have a tendency to enteroptosis, movable cecum and sigmoid, a lack of fat on the large labia, unusual distance between clitoris andu rethra, narrow, short vagina, a lack of well-developed fornices, malposition, rudimentary uterus or infantile or fetal uterus (cervix longer than the corpus), various degrees of double or divided uterus, small ovaries, narrow pelvis, persistence of fine hair on the lips, and diminished trichosis of the axilla. There is frequently dysmenorrhea. There is often fluor albus. There is a tendency to vaginismus, often sterility, and a resulting psychic depression. There is decided asthenia.

Hypophysis.—The interrelation between the hypophysis and ovary is very intimate. Cases show imperfectly acquired secondary sexual characteristics when the hypophyseal lesions antedate puberty, and a resultant amenorrhea, with retrogressive sexual changes, when the malady develops after adolescence. As a result of preadolescent castration, reproduction is impossible and the acquired characteristics of sex fail to appear. In the ovary there are three, and possibly four, glandular elements. The reproductive function may not be impaired, even though full secondary sexual characteristics have not been acquired. The glandular element, which is responsible for the physical changes of puberty, is probably a secretion of the interstitial cells, and differs from that which is concerned with ovulation. The relation of hypophyseal disorders of overfunction or underfunction to physiologic activities of the ovary, *other than those concerned* with the acquirement of adolescent characteristics, is very close, and amenorrhea is an early symptom, with overfunction or underfunction.

When hypopituitarism dates from the adolescent period there occur other changes than failure of full development of the long bone. There occurs in the male a feminine disposition of the adiposis, the males possess a feminine type of skeleton with broad pelvis, there are small and delicate extremities, there is the tapering type of hand. In hypopituitarism there is a certain undefinable facial resemblance, due to maxillary prognathism, while in acromegaly there is mandibular prognathism.

SKIN AFFECTIONS AND THE INTERNAL SECRETIONS

Goltz divided the spinal cord of the female dog, and the animal went through all the phenomena of heat, pregnancy, lactation, etc. This showed that it was not through the nervous system, but through the channel of the circulation and by the action of the autonomic nervous system that the various processes related to puberty and pregnancy take place. The thyroid, the adrenals, the ovaries, the hypophysis, and the other glands act to some extent in harmony, to some extent in opposition, to each other. In diseases one may

take up the function of the other, or they may all unite in a common action against certain products; some or all may be affected in like or varying degrees by infections or by toxic substances.

Politzer's conclusions are of great interest and are substantially as follows: Certain involvements of the skin occur during pregnancy and disappear on termination of pregnancy. There are certain dermatoses of puberty, of menstruation, of pregnancy, and of the climacterium. Some of the skin annoyances of pregnancy may depend on the cessation of ovarian function and the cessation of menstruation during that time, or they may be due to the influence of the corpus luteum or of the placenta.

At puberty there is a great change in the skin; there is a special increase in the adipose tissue characteristic of the female; there is a growth of hair in the pubic and axillary region. Acne may be considered as related to the sexual apparatus only in so far as the establishment of puberty physiologically brings about local circulatory changes in the skin of the face, which renders the latter a more favorable soil for the development of the special micro-organisms of acne.

The regular monthly hyperemia of menstruation may occur in any part of the body, and cause dilation of the blood-vessels in any part of the body, may cause changes in any of the skin diseases, or altered skin conditions, which are present in face and elsewhere. Simple erythema and the various forms up to erythema nodosum may occur regularly before, during, or after menstruation, and is often associated with menstrual irregularities. Cases of purpura in connection with menstrual irregularities may be regarded as due to pathologic processes in the skin of a more intense nature than those which cause erythema.

Urticaria and angioneurotic edema may be related to menstruation. Menstrual urticaria may appear at regular intervals with each monthly period; in other cases it occurs only with menstrual irregularities, such as amenorrhea. The angioneurotic edema not infrequently occurs in definite relation to menstruation; they may be anaphylactic phenomena. The most frequent skin disorder related to menstruation is herpes. One

woman in twenty suffers from frequent or habitual menstrual herpes, occurring on the external genitalia or in the sacral region or the face, especially the lips. It is probably a toxemia of ovarian origin.

Hypertrichosis (excessive development of hair), more or less over the entire surface, but especially in the face, is pathologic; it is commonly associated with ovarian disorders. Disturbances in the function of the ovaries produce changes in the suprarenals and hypophysis. Temporary cessation of ovarian functions during pregnancy causes increased secretion of the hypophysis and adrenals. Hypertrichosis has been said to be due to the excessive function of the hypophysis and adrenals. Hypertrichosis of puberty, the hypertrichosis of ovarian disease, and the hypertrichosis of the climacterium are due to inadequate ovarian secretion acting in this manner.

Hyperpigmentation at puberty, during pregnancy, and with ovarian disease is not infrequent. Chloasma gravidarum occurs in three-quarters of pregnant cases. It is possible that the ovarian secretion produces secondary disturbances in the function of the adrenals.

Herpes gestationis is a severe disease, characterized by an eruption of more or less extensively distributed grouped lesions, made up mainly of vesicles and bullæ accompanied by intense pruritus. The disease is dependent on pregnancy, and promptly disappears when the uterus is emptied.

It has been suggested that the pruritus, urticarias, and dermatitides of pregnancy are due to the same agents that cause hyperemesis, nephritis, hepatitis, and eclampsia; namely, anaphylaxis brought about through absorption of foreign proteids from the placenta. Some cases of dermatoses in pregnant women have been relieved by the injection of 20 c.c. to 30 c.c. of serum from the blood of healthy pregnant women.

The dermatoses of the climacterium, so far as they are related to the genital system, are of the same kind and nature as those occurring with anomolies of menstruation and are dependent on altered ovarian secretion. At any rate "reflex" has nothing to do with these cases of skin involvement.

Knauer transplanted the ovaries of rabbits and dogs between the fascias of the abdominal wall and into the mesometrium, being careful to remove absolutely every bit of ovarian structure. In the abdomen he fastened the ovary with two sutures between folds of peritoneum, the ovaries being then nourished through endosmosis or through plasmatic circulation. New vessels grew into the ovarian tissue and furnished its subsequent support; this change began as early as the fourth day. Examination at various periods showed that a small part of each ovary usually degenerated, and new connective tissue appeared in the place of the lost cells. In all cases in which a complete degeneration of the ovary occurred, atrophy of the breasts and of the genitalia was found. The muscle of the uterus was atrophied, the intermuscular connective tissue was increased, the mucous membrane was atrophied—changes like those which occurred after double castration. Retention of function on the part of the transplanted ovaries was always evidenced by the growth of follicles in a normal manner, by the ripening of the follicles, and by the discharge of the ova. In all such cases the normal character of the breasts, of the uterus, and of the genitalia was preserved, and in the younger animals all these organs underwent a natural development.

Knauer's results proved that the preservation to the organism of functionating ovaries preserved the breasts, the genital organs, and the sexual instinct. This result occurs through the absorption into the circulation of ovarian secretion. This internal secretion reaches the blood through the lymph-channels. The trophic function which the ovary exerts upon the body stands in closest relation to its ability to form ripe ova. Ovarian tissue which has ceased to develop ripe ova has lost its secretory function.

The normal human ovary produces and expels ova capable of being fecundated. Ovulation, as a rule, occurs from four to

eight days before menstruation, but it may occur at other periods, as ripe ova, practically speaking, may be present at almost any time. In the intermenstrual period follicles ready to burst are present. Ovulation may occur during pregnancy. The relatively frequent occurrence of pregnancy during the temporary amenorrhea of lactation is a proof of ovulation during this time.

Ovulation and menstruation are both the result of the secreting function of the ovary and are not related as regards cause and effect. Menstruation occurs only when the ovary is capable of producing ripe ova.

Ovulation and menstruation are evidences of the functional capability of the ovary. Ovulation may occur without menstruation, but the latter never without follicle formation. We have here an evidence that functional secretory activity of the ovary is necessary to stimulate the mucous membrane of the uterus to its periodic changes. The part which thoe varies play in the development of the body, the effect of their influence upon the breasts and the genital tract, at puberty, before each menstrual period, at the menopause, and after castration, are proofs of their secreting power. The experiments of Knauer and others show that it is simply the presence of ovulating ovaries and the absorption of their secretion which are of importance to the body, and that their action upon the uterus is in nowise reflex in character since, when removed and implanted elsewhere, they influence the autonomic nervous system, act directly on genital structures and thus every sexual peculiarity is absolutely preserved.

Menstruation is a periodic loss of blood from the lining of the uterus. Menstruation implies a regular congestion produced by the ovarian secretion acting on a uterus of such a structure and containing such a lining that the congestion is relieved by the bursting of capillaries and the outflow of blood. Menstruation implies functionating ovaries, a developed uterus, a normal or fairly normal state of the blood, a normal pituitary and an open unobstructed canal from the uterus through the cervix, vagina, hymen, and vulva.

Definition.—Amenorrhea means an absence, a too late beginning, a temporary cessation, or a too early permanent cessation of the menstrual function. It is, therefore, of two forms. The first or primary form is that in which menstruation has not been established; the second is the secondary form, in which menstruation ceases after having once been regularly evidenced, whether the cessation is temporary and lasts for months or years, or whether it is permanent, as in early menopause or climacterium præcox. Amenorrhea may be relative or absolute. Relative amenorrhea implies that menstruation is extremely slight, while absolute amenorrhea means that no blood is lost at all.

Primary Uterine Hypoplasia.—There may be an absence of the uterus, with or without the presence of ovaries, for which embryologic causes may be at fault. General hypoplasia of the vascular system is a cause of insufficient development of the genitalia. Forms of uterine subdevelopment occur, associated with general hypoplasia. Winckel has shown that, in the development of the uterus and tubes, the situation of the Wolffian body close to the ducts of Müller may influence, to a very great degree, their growth, and is a frequent cause of malformation. The early completion of the Wolffian bodies, their opening into the sinus urogenitalis, the growth of the Müller's ducts along the Wolffian, and their crossing at that spot where the union of Müller's ducts finds its upper limit, are anatomic embryologic factors easily recognized as causes of uterine maldevelopment and hypoplasia. Further, the origin of the ligamentum ileo-genitale rotundum at this upper limit, its close union with the ducts of Müller, the fact that its line of development in a measure opposes the union of the ducts, in addition to tension, pressure, and torsion exerted by the neighboring organs, such as the Wolffian bodies, the bladder, the ureters, the vessels and nerves of the uterus and rectum, are important factors influencing the development of the uterus. In addition, Winckel recognizes the occurrence of abnormal cells in the septum between the ducts of Müller, and general hypoplasia of the vessel system, as additional causes of maldevelopment.

Secondary Uterine Hypoplasia.—Aside from the embryologic causes here mentioned, the forms associated with general hypoplasia and secondary atrophy resulting from constitutional diseases, we recognize in the ovary and its secretion the factor which governs the development of the uterus, the genitalia, and the breasts, and the factor which is concerned in the activity of these organs and the regulation of menstruation. In castrating young guinea-pigs the breasts are later found to be one-fourth the normal size, the genitalia are small, the vulva is one-third smaller than normal; the uterus is as small as at birth, showing very slight development of the muscle and endometrium, and containing no ciliated cells. The breasts show no glandular tissue, the mammillæ are hypoplastic.

Poorly developed ovaries are the result of failure of development of the body in general, or represent a failure of development of the ovary itself through embryonal disturbances. Diseases of children, such as scarlatina, measles, mumps, diphtheria, typhoid, etc., are not rarely the cause of eruptive, hemorrhagic, or necrotic involvements of the vagina, uterus, tubes, and ovaries. The ovarian or uterine involvement may be of such a degree of severity as to interfere with the development of the uterus and of the ovaries. If the energy and development of the ovaries is interfered with, it must of necessity result in an under-development or hypoplasia of the uterus and tubes. Recent knowledge in the field of the function of the hypophysis shows that the relation between this gland and the ovaries is very close. Diseases of the hypophysis, whether due to tumor or to functional disturbances, whether these result in hyperfunction or hypofunction, have a decided tendency in the preadolescent period to so markedly involve the ovaries that these in turn fail to exert their proper trophic influence on the genitalia. The absence of ovaries, a poor development of these glands, and insufficient secretion of ovarian substance, or a diversion of ovarian secretion to other organs of the body, always causes a total or partial or relative failure of uterine development, or causes uterine atrophy. There

may be a uterus fœtalis, a uterus infantilis, or a hypoplastic uterus.

Hypoplasia is of two kinds—concentric, the severe form; and eccentric, usually temporary. It may be taken for granted, if the ovaries on examination are found to be present and large and if molimina menstrualia occur, that the ovaries are not at fault, but that the condition is due to embryonal causes mentioned by Winckel, or to a general hypoplasia or to direct involvement of the uterus by constitutional diseases.

Amenorrhea of Chlorosis.—Amenorrhea is frequently a symptom of chlorosis. It seems to be related to a temporary functional inactivity on the part of the ovaries. Chlorosis is an illness occurring exclusively in girls, most frequently during the years of development and the years immediately following, and showing a tendency to recur. It develops spontaneously without evident cause, and has no connection with conditions relating solely to nutrition, since its occurrence among the better classes is very frequent. It affects directly only the condition of the blood, without causing constitutional degeneration and without great injury to the general nutrition. No theory with regard to chlorosis which leaves out of consideration its occurrence in girls only, at the time of, or in connection with, sexual development deserves attention. It occurs most frequently between the fourteenth and twentieth years. According to Niemeyer, such cases as occur for the first time after the twenty-fourth year are almost never chlorosis.

Von Noorden believes the stimulation which the ovary exerts upon the blood-forming centers to be one of its important functions. This action is not exerted reflexly, but through the channels of circulation by means of the ovarian secretion. In chlorosis there is often associated an under-development of the genitalia. The pelvis in a certain proportion of cases is of the child's type; in others there is poor development of the external genitalia, or a uterus infantilis, small ovaries, poorly developed breasts, etc. Seventy-four per cent. have failure of genital development of one form or another. Among non-chlorotics these conditions are found in only 20 per cent. Menstruation is, as a rule, disturbed. During the chlorosis there is very

frequently an absolute or relative amenorrhea. Those affected with menorrhagia always show a decided change in the mucosa. In all, 77 per cent. show a weakening of the menstrual function.

Amenorrhea of Obesity.—In the case of poorly developed ovaries menstruation, if present, is often irregular and scanty, but may eventually become well established or may cease. Although these persons may be well developed, yet they may show poorly developed genitalia. In connection with small ovaries is found a small uterus, the breasts being well developed but containing little glandular tissue. There is a tendency to fat, which distinguishes these individuals from those with well-developed genitalia.

Amenorrhea is not infrequently associated with obesity or lipomatosis universalis. In such cases a small under-developed uterus may be found. As a matter of fact, in all these cases obesity is partly the result of the failure of sufficient ovarian or pituitary secretion, or both. The amenorrhea and the uterine hypoplasia are evidences of this failure. Coincident with failure of ovarian activity is a probable diminution in the activity of the thyroid gland. The resulting diminution in metabolism produces the obesity. Von Noorden classifies obesity as follows:

1. Obesity due to the ingestion of fattening foods. The oxydation-energy is normal, the cause of the obesity being a disproportion between the intake and the output.

(*a*) Overfeeding obesity (immoderate use of foods and drinks).

(*b*) Sluggard's obesity (insufficient muscular exercise).

(*c*) Combination of the factors *a* and *b*; a very common type.

2. Thyreogenic obesity (diminished oxidation-energy), in which the proportion between the intake and the bodily functions may correspond to the normal average, but the condition is frequently complicated and strengthened by factors such as mentioned under *a* and *b*.

(*a*) Primary thyreogenic obesity (based upon independent changes of the thyroid gland).

(*b*) Secondary thyreogenic obesity. The hypofunction of the thyroid gland in the last group of cases is determined by

the remote effect of other organs, such as the pancreas, the hypophysis, the suprarenal bodies, the thymus, the genital glands; these conditions not being very well elucidated at the present state of our knowledge.

Another one of the glands of internal secretion, the pituitary, is recognized as having an all-important bearing on the question of amenorrhea, especially when associated with obesity. Hyperfunction of the hypophysis, anterior lobe, causes skeletal overgrowth and tends to sexual dystrophy. Hypoactivity of the anterior lobe causes failure of development of the bony system (dwarfs, etc.) and the secondary sexual characteristics. Hyperactivity of the posterior lobe causes lowered nutrition. Hypoactivity of the posterior lobe means altered metabolism, so far as the carbohydrates are concerned, and a more or less general adiposity. So marked is this adiposity, and so characteristic is the sexual alteration which is associated with it, that to this condition is given the name dystrophia adiposogenitalis.

Vicarious Menstruation.—The constitutional element in the process of menstruation sometimes results in the occurrence of vicarious menstruation. Under this designation we consider bleedings occurring from places other than the uterus at regular intervals in a patient suffering from uterine amenorrhea. The most frequent location for this bleeding is the nose, usually the lower turbinated bones.

Some cases may be due to uterus rudimentarius, with or without the absence of the adnexa of one side. The uterus is small and may possess no cavity. Such cases and cases with vaginal defects may have vicarious menstruation from the nose at regular intervals for months. The mammæ and external genitalia are small; the patients may suffer from molimina menstrualia every three or four weeks for periods of several days. Eventually severe pain is experienced, constantly associated with nausea and vomiting. Severe molimina menstrualia, sickness of the stomach, and rectal bleedings may furnish the indications for operation. Since no bleeding takes place from the endometrium, the ovarian secretion through cumulative action is responsible for the severe pain. After castration all the annoying symptoms disappear.

Very young children with well-developed pubes and breasts have suffered from periodic bleedings of the nose. Older well developed girls may suffer from regular bleedings from the nose, which stop, however, when real menstruation begins. In rare cases there are nose bleedings at regular intervals, which stop during pregnancy, only to begin afterward, and after a continuation of several months cease again on the occurrence of a second pregnancy. Bleedings have been described as occurring regularly from other mucous membranes, the trachea, the lungs, and the stomach. In the latter instance the bleedings were not always associated with vomiting, the blood being usually found in the feces. In other cases there are bleedings into the thyroid gland. In cases with poorly developed uteri these bleedings disappear when the uterus begins to functionate properly.

Amenorrhea of Atresia.—Amenorrhea is due to a primary constitutional or to a primary local cause. The latter is frequently overlooked.

An atresia may involve the hymen or the vagina. This condition has been generally viewed as congenital. The investigations of Neugebaur, however, show that among the reported cases of stenosis or atresia one-third are congenital and two-thirds are acquired. The investigations of Nagel and of Veit show that an atresia vaginæ, when the uterine canal is normal, is usually an acquired lesion. When there is a maldevelopment of the vagina and a congenital absence of its lumen, then the uterus is also found to be maldeveloped and two-horned. Piering divided the causes of acquired stenosis and atresia into traumatic, inflammatory, chemical, and thermal.

In children various degrees of atresia, stenosis, and changes in the hymen may occur as congenital alternations or as a sequence of gonorrhea, of the milder forms of vulvovaginitis, or with and after the various infectious diseases, most frequently after typhoid fever and scarlatina. Any irritation, as enuresis, may cause excoriation with a conglutination of the hymen. Such conditions sometimes obtain in the newly born and are not recognized. A conglutination may occur through the excessive

size of the hymen and constant rubbing. A congenital conglutination of the hymen often breaks spontaneously, but, if acquired, is tenser because of the union of thicker hymen folds. Weak and anemic children are more disposed to milder forms of vulvovaginitis than other children. The presence of milder forms of vulvovaginitis is often overlooked, while the failure of treatment in other cases is likewise a responsible factor in producing future annoyances. In infectious diseases there is often a colpitis adhesiva without symptoms.

The lesions produced by infectious diseases in children include vulvovaginitis. The first menstruation with acute infectious diseases, especially if amenorrhea follows later, is often due to an affection of the vulva or vagina accompanied by a loss of epithelium, by bleeding, by the presence of ulcers, and by subsequent adhesions. The so-called menstruatio præcox is often only such a vulvovaginitis. Scarlatina especially may cause thrombotic necrotic processes in the vagina. We know that various forms of atresia may occur in adults, even in multiparæ, as a result of a colpitis adhesiva or as a result of ulcerations accompanying fluor, or leukorrhea of gonorrheal origin, if no menstruation or coitus take place, and that too without ulcerations and without annoying preliminary symptoms.

Some of the results of atresia are more extensive than generally supposed. The occurrence of a hematocolpos with an atresia can be readily understood. The occurrence of a hematosalpinx, however, is not so easy of comprehension. This condition, in a large proportion of cases, is dangerous in character. Scarlatina, and especially gonorrhea, produce local, often neglected affections which cause atresia and also a salpingitis with closure of the tubes. Typhoid fever, scarlatina, and measles may produce, without symptoms, an atresia, and the affection may extend through the cervix and uterus into the tubes, with closure of the latter.

Diagnosis.—If no menstruation has taken place up to the sixteenth year, subdevelopment of the body, congenital pelvic anomalies, hypoplasia of the uterus or ovaries, or chlorosis or obesity must be taken into consideration. If no menstruation

takes place up to the eighteenth or nineteeth year, an atresia of the hymen or vagina is one of the possibilities. Attention is rarely called to this condition in girls under sixteen years of age. When observed, it is usually noted between the eighteenth and the nineteenth years, because of the pain that is often felt at regular intervals. In other words, the menstrual function is carried out, but the exit of blood is prevented by the atresia. If examination excludes this involvement, which is sometimes congenital, but more frequently acquired as a result of vulvovaginitis due to the infectious diseases of childhood or to gonorrhea, either failure of development of the genitalia is present or else under-development of the ovaries, uterus, or both is to be found; that is, we are dealing with some form of hypoplasia. Degrees vary between absence of uterus, uterus fœtalis, uterus infantilis, and hypoplastic uterus. It is important to measure a small hypoplastic uterus when made out by bimanual examination. A uterus may be small and yet the sound may show the cavity to be of normal length, which indicates a thin muscular wall. If the uterus is small and the sound shows the cavity to be shorter than normal, this form of hypoplasia is of far greater significance. Diagnosis and prognosis depend on the character of molimina menstrualia. *Molimina menstrualia* comprise the pain and sense of weight felt in the pelvis and back, and sometimes in the region of the ovaries, at regular four-weekly intervals. If there are slight or no menstrual molimina, the blame for the amenorrhea rests wholly or in part with the ovaries. If menstrual molimina occur, the ovaries evidently functionate and produce a periodic congestion, but the uterus is then of such a size and character that the exit of blood does not occur. Bimanual examination made through the rectum, with the aid of a catheter in the bladder, is sufficient to show the existence of a uterus and to demonstrate its size. If there is amenorrhea, or if in place of the normal menstruation vicarious hemorrhage occurs (urethra, rectum, lungs, stomach, mouth, nose, and eyes), it is necessary to consider the possibility of an atresia of the genital canal. If an atresia is present, it is possible that, as a result of hemorrhage into the tube, a hematosalpinx is also present.

Secondary Amenorrhea

Amenorrhea may occur after regular menstruation has been well established, and is due to hematogenous changes, altered metabolism altered ovaries and uterus, or to pregnancy or lactation.

Amenorrhea Due to Blood States.—Infectious diseases, by lowering the vitality of an individual and causing a secondary anemia, may be the responsible factor for amenorrhea. It is noted that after typhoid fever, scarlatina, etc., menstruation may cease for varying periods of from three to six months or more. In such cases a newly formed atresia of the vagina must be excluded, for we know that ulcerative and degenerative changes may be produced in the genital mucosa by infectious diseases. Beginning pulmonary tuberculosis is also a cause of amenorrhea, and the latter is frequently one of the very first symptoms. The differential diagnosis from chlorosis must be made. Acquired or secondary amenorrhea also results from involvement of the blood state in chlorosis, or leukemia. In the former we are dealing with a disease usually present during the developmental and adolescent period of life. It is a condition which occurs between the fourteenth and twentieth years and very seldom occurs for the first time after the twenty-fourth year. Chlorosis is a disease which is almost never found in men. For these reasons the amenorrhea of chlorosis probably bears some relation to the secretory activity of the genital glands.

Amenorrhea Due to Involvement of the Ductless Glands.—Derangement of the various ductless glands is not a rare cause of amenorrhea. Cessation of menstruation may occur with Addison's disease, with acromegaly, and especially with myxedema and Basedow's disease. This latter disease is most frequent in women, and presumably so because of the delicate balance which exists between the ovaries on the one hand and the thyroid gland on the other. Given, then, a hypersecretion of the thyroid, it is only natural to reason that the function of the ovaries is either primarily or secondarily inhibited. The thyroid and ovarian secretions are in some respects antagonistic, and in others complementary. In myxedema, we have a

diminution of thyroid function, and perhaps a parallel diminution of the ovarian secretion. Myxedema produces such an alteration in tissue metabolism as to naturally affect the activity of the various organs, among which the ovaries and the uterus are of importance.

The hypophysis is a gland composed of an anterior and a posterior lobe. The hypophysis may secrete too much, or it may secrete too little. It is strange that with either hyperactivity or hypoactivity of the hypophysis there is involvement of the ovaries, and consequently diminished menstruation or absolute amenorrhea. In every case of amenorrhea an involvement in the form of acromegaly, due to overactivity of the anterior lobe in adults, or obesity associated with diminished function of the posterior lobe, should be looked for. In other words, when these conditions develop in adults, regressive changes occur in the ovaries and uterus and menstruation diminishes or may cease.

Amenorrhea Due to Ovarian Atrophy.—Acute infectious diseases influence the ovarian secretion, in some instances producing ovarian and uterine atrophy. Marked involvement of the secretory activity of the ovaries results in uterine atrophy. Such ovarian and uterine atrophy may also occur as the result of puerperal fever. Exudates about the uterus, too, may interfere with its blood-supply and result in atrophy of the uterus.

While not of frequent occurrence, diabetes may be responsible for the occurrence of amenorrhea, by causing atrophy of the ovaries and then of the uterus. Another cause of ovarian atrophy with resulting amenorrhea, and one which is not generally recognized, is the prolonged use of opium. On the authority of Olshausen, this is an influential cause in the production of ovarian secretory inactivity and structural atrophy.

What parts of the ovary produce secretion? We know little about the secretion of the follicles, yet they probably nourish the uterine lining. Some contend that the corpus luteum interferes with ovulation, and in this way prevents the interruption of pregnancy. L. Fraenkel says that the corpus luteum in cycles produces the impulse of nutrition in the uterus which prevents it from undergoing atrophy. When an ovum begins

to grow, the yellow body furnishes still more nourishment to the uterus.

The uterine lining is influenced by the ovaries, probably by the follicle secretion. The lining reacts on the ovaries, too, for if the uterus is removed ovarian secretion gradually diminishes, and ceases ofttimes at the end of two years or more. The lining of the cervix and uterus and their hormones react on the ovary. When the ovum comes it stimulates the ovary to the production of the corpus luteum, and the corpus luteum stimulates still further the decidua and uterine growth. We are certain that the relation of the thyroid to the ovary sensitizes the thyroid gland, and that the relation between uterine lining and ovary sensitizes the ovary. This, coupled with the various changes in balance which occur at puberty, menstruation, etc., is responsible for the instability which produces the various nerve phenomena due to hypersecretion or hyposecretion, or variations between the two, which make women the weaker sex.

The ovary, especially the corpus luteum, produces a hormone which, united with the usual vital processes, causes decidual cell growth. In the second period of its existence it prevents ovulation. Its persistence during pregnancy is due either to the embryo or to the placenta. The integrity of the uterus, perhaps, depends on the functions of the follicles. The function of the corpus luteum is to promote the nesting of the egg. The secretion of the "interstitial part" which may perhaps control the vasomotor apparatus is not definitely known. Bouin believes in a functional relationship between the corpus luteum and the interstitial gland. Biedel thinks that the interstitial gland controls the cyclic changes in the genital canal.

In cases of uterine atrophy there are usually anatomic or clinical evidences of a hypofunction of the ovaries, such as small ovaries, atrophy of the ovaries, a failure of ripening of the follicles, degenerative changes in the follicles, inflammatory processes, and so on. The absence of molimina menstrualia speaks for like processes in the ovaries and uterus.

Although primary atrophy of the uterus may exist, most of the atrophies depend upon a previous injury to the ovaries.

Under physiologic atrophy belong senile involution and the so-called lactation atrophy.

Infectious diseases produce changes on the ovary and a weakening of the entire system. These ovarian changes are also produced by diabetes, Basedow's disease, myxedema, psychoses, anemia, and poisons, such as morphin (especially), lead, mercury, phosphorus, and arsenic. The most important symptom of atrophy of the ovaries is amenorrhea. Other symptoms are sterility, fluor albus, pain in the back, etc. The general symptoms are headache, loss of appetite, palpitation, fatigue, and melancholic depressive conditions. The severe climacteric annoyances, such as are seen after castration or in the climacterium, especially the vasomotor symptoms, do not predominate with lactation or other atrophies. This may be due to the fact that some ovarian activity still persists, or else that that part of the ovary which protects these functions is intact and there is simply a disturbance of the follicles apparatus, thus producing amenorrhea and sterility.

Climacterium Præcox.—Menopause occurs likewise in younger women, and is due to an early cessation of ovulation and functional activity on the part of the ovary, and is therefore an early senescence. Such a climacterium præcox usually implies an early atrophy of the uterine genitalia, often going hand in hand with increasing obesity. In some instances ovulation may continue.

At and after puberty we judge the vitality of the ovary by its ability to bring its ova to a stage which may be called ripe. For the expulsion of an ovum from the Graafian follicle, a gradual increase in size of the follicle takes place, depending partly on an increase in the amount of the liquor folliculi. The opening which serves as an outlet for the ovum is probably the result of the reaction or chemical effect produced by a normal ripe ovum. In those cases of young children with well-developed breasts and genitalia in whom menstruation begins, there is an unusually strong development of the body, and the ova as well as the follicles differ in no way from those found in menstruating adults. In the newly born and in children, follicles of the same size and even larger ones exist without bursting,

the so-called *atresic follicles*. These ova and follicles go through the same stages of development as in the case of adults. That they are not capable of fecundation is shown by the fact that the ova are only one-half as large as in adults. Unbroken, persisting, or atresic follicles may occur at various ages in adults. Larger follicles and follicle cysts occur in the ovary without opening. In women in whom the follicles do not open, but do degenerate, cessation of menstruation may occur as a result of the so-called missed ovulations. These facts speak for a chemical or enzyme power in only the normal, ripe, energetic ovum.

Amenorrhea of Obesity.—Relative or absolute amenorrhea even before the age of thirty may occur gradually, without marked symptoms, often in patients who grow fat. It is probably due to early involution of the ovaries, and if absolute is called climacterium præcox. Obesity is viewed by some as the result and by others as the cause of the amenorrhea. In this amenorrhea of obesity we distinguish two classes: the phlegmatic and the excitable type. Probably an involvement of the ductless glands is in a great measure responsible for this condition. We are concerned here mainly with the activity of the ovaries and of the thyroid. A diminution in the secretory activity of the ovaries and of the thyroid diminishes tissue metabolism, and it is only natural to expect as a result thereof accumulation of fat and a gain in weight. When the ovarian and thyroid secretions diminish in equal degrees so that the balance between the two is of the same nature as in the normal woman, the phlegmatic type of obesity results, and a condition in some degree comparable to myxedema is the consequence. If there is a diminution of ovarian and thyroid activity, and the ovarian activity is so diminished that a relative degree of thyroid hypersecretion exists, we have, in addition to the increase in weight, an excitable condition due to the relative hypersecretion of thyroid extract. In other words, there is a condition of excitability resembling the annoying symptoms often associated with the climacterium, or with the menopause consequent on double oöphorectomy. Climacterium præcox, therefore, follows more or less the types observed at

the menopause, and the obesity may be referred to the same cause.

Reference has been made to the association of the hypophysis gland with amenorrhea and also with obesity. The amenorrhea is due to the fact that the trophic relationship between hypophysis and ovary is so marked that each acts upon the other; involvement of the ovaries may influence the hypophysis, but more certainly than this involvement of the hypophysis affects the ovaries; involving ovarian secretory functions, and through them, or directly through its effects upon the uterus, influencing the nutrition of that organ, thus markedly affecting menstruation or causing it to cease. Diminished activity of the posterior lobe, in particular, can be reconciled with trophic involvement of the uterus and ovaries, when we realize the effect which pituitrin may have, especially on the pregnant uterus. Diminished activity on the part of the posterior lobe, however, which is closely related to this question by its influence on carbohydrate metabolism, can be readily understood to result in failure to burn up the carbohydrates, with a resultant accumulation of fat. Hence, any case of progressive general obesity associated with atrophic changes in the genitalia must be considered as a possible case of hypophysis obesity, extreme cases of which are known as *dystrophia adiposogenitalis*. There is no doubt that some cases of obesity are due to ovarian inactivity, that some are of a myxedematous type and due to diminished thyroid activity, that many are of the hypophysis type, and that probably a large number are due to an involvement which includes failure of function in more than one of these three glands. There is a form of obesity, too, due to involvement of the pineal gland, and possibly also some cases which have been described are due to adrenal involvement, but in these types atrophy of the genitalia does not result; on the contrary, there is usually found what may be called hypergenitalism.

Amenorrhea of Castration (Induced Menopause).—Knauer found, after castrating rabbits, that the uterus atrophied and that the intermuscular connective tissue was increased. Sokoloff castrated dogs and found that the uterus, especially

the circular layer, became atrophied, the vessels were thickened and their lumen smaller. Jentzer and Beuttner, on castrating cows, found an atrophy of the muscle and of the glands of the uterus, an increased growth of the connective tissue, and changes in the stratum vasculare.

One year after castration the uterus is atrophied, the endometrium likewise, the connective tissue is increased. There is atrophy of the cervix, an atrophy of the corpus, a sclerosis of the vessels, which show a growth of the intima, and an endarteritis obliterans, especially in the larger vessels. Few glands are present and the connective tissue is increased. After castration, the changes are like those occurring at the menopause. The removal of the ovaries diminishes the excretion of phosphorus. Less carbonic acid is given off and less oxygen is absorbed. The body-weight increases. The diminution in the excretion of phosphorus after double oöphorectomy explains perhaps the value of this operation in osteomalacia

Amenorrhea of the Climacterium (Menopause).—The presence of normal ovaries preserves uterine muscular tone. The ovarian secretion exerts a trophic stimulation upon the uterus and an influence which produces, during the fertile period, those regular painless uterine contractions which have the effect of auto-massage upon the uterus and which preserve its muscular tone. In ovarian changes at the climacterium the muscular wall and the mucosa atrophy and periodic pelvic congestions do not take place. At and after menopause, as a result of normal involution of the ovaries, the uterus undergoes regressive changes, the portio shrinks, the corpus atrophies, the connective tissue is increased, the vessels are sclerosed, the mucous membrane is thin, flattened, and indurated, and there results the so-called senile uterus.

Amenorrhea of Pregnancy.—Ovarian secretion produces a general congestion, most marked in the pelvis and uterus. If this secretion be opposed by an added secretion which antagonizes and nullifies it, then the menstrual congestion fails to occur. In pregnancy we are dealing with a fecundated ovum. A fecundated ovum settles into the decidua by dissolving the cells about it and boring a hole for itself whereby it

sinks into the decidua. This is accomplished by the enzyme products of the fecundated ovum. The trophoblast or outer layer of this ovum has a destructive action on maternal tissues and is held in check by elements contained in the maternal blood. These fetal cells are at all periods of gestation given off into the maternal circulation and constitute a fetal or placental secretion. There exists probably an antagonism between the ovarian secretion, on the one hand, and the enzymes of the fecundated ovum on the other. Hence in pregnancy we may assume the amenorrhea to be due to the fact that the pre-menstrual congestion usually produced by the ovarian secretion is nullified by the opposing enzymes of the fecundated egg. A curious paradox is furnished by the case of a woman who has not menstruated for years except during the first three or four months of several successive pregnancies.

Amenorrhea during Lactation.—Ribbert implanted the mamma of a young guinea-pig, with its covering of skin, into a cut near the ear. The wound healed, and five months after the operation, the animal having borne two young, this mamma secreted milk normally, a proof that the connection between the breasts, and the ovary and uterus is to be found at least partly through the channels of the circulation.

Goltz cut through the cord of a dog at the level of the first lumbar vertebra, and later saw signs of rut appear. After coitus one dead and two living young were born. The breasts were well developed and lactation and nursing followed the normal course. Since these changes, the sexual tendency, and the process of labor could not have been excited through the cord, it must be that a certain secretion of the ovary, acting through the medium of the circulation, gives the stimulus for the exercise of those functions.

After labor, lactation is probably stimulated in addition by the thyroid or some internal secretion. The ovarian secretion seems to exert no effect or have less action upon the uterus; therefore the uterus rarely undergoes its periodic or trophic stimulation. Continued nursing causes continued contraction of the uterus and is an important factor in the normal involution of the uterus after delivery. Menstruation does not take place and

there is a natural tendency to trophic changes which end in lactation atrophy of the uterus.

Lactation Atrophy.—There are cases of amenorrhea which persist for varying periods of time, even after nursing is stopped, in women who have nursed their children for an unusual number of months. As a result of nursing there occurs a uterine atrophy which is normal up to a certain degree only. In many women bimanual examination and the use of the sound show that the uterine atrophy has gone beyond the normal. The atrophy which has occurred in the genital sphere may prevent the re-establishment of menstruation for varying periods of time.

Under atrophy of the uterus belong those cases in which the uterus was previously normal in size, with a cavity of normal length. The changes occurring in lactation atrophy are: (*a*) Eccentric, with a cavity of normal size but with a deficiency of muscular elements; (*b*) concentric, with a cavity smaller than normal. The former cases are not infrequently associated with small adnexa. It may be mentioned that the majority of nursing women who have a uterus under the normal size show all the evidence of poor nutrition, and especially laxity and flabbiness of the general body structures. In "prematurely aged women" lactation is poorly borne. It is in these cases that Frommell finds the greatest amount of uterine atrophy, and he supposes it to be an evidence that nursing deprives the body of a large amount of nutrition.

Thorne considers lactation atrophy to be a reflex trophoneurosis, and believes that every nursing amenorrheic woman has a hyperinvoluted uterus, without, however, an involvement of the ovaries. He acknowledges the frequency of anemic conditions associated therewith, but observes that those cases menstruating during nursing show no atrophy of the uterus. This associated menstruation is an evidence of sufficient ovarian stimulation, and of course the uterus does not atrophy.

Amenorrhea Due to Curettage.—A very thorough curetting of the uterus is not infrequently followed by a temporary or permanent cessation of the menstrual function through uterine atrophy. In some instances there occurs a union of the anterior

and posterior uterine walls, so that an atresia of the uterus results. In other cases a too thorough curetting has produced a rapid involution of the ovaries and uterus, but in just what way is not definitely known. The same annoying conditions have been noted after a too deep cauterization of the uterine cavity by steam by the method known as atmocausis. A curet with a sharp, cutting edge may gouge out strips of myometrium and damage a uterus to a serious degree. Wounds of this character are frequently followed by the formation of scar tissue, and may be an important factor in subsequent amenorrhea.

Atmocausis.—Czempin reported a case treated by atmocausis in which menstruation did not recur and the patient suffered from symptoms of climacterium præcox. The uterus was found to be small and hard, the cervix was obliterated by cicatricial adhesions.

Weis atmocauterized a nullipara. No menstruation occurred and the patient suffered with headache and bleeding from the nose. Several months later the uterus was found to be small, hard, and shrunken; the cervix was closed by cicatrices and a sound could not be passed. Two months later the cervix was passable by a sound, but for a distance of only 3 cm. The body of the uterus was flat and shrunken. Atmocausis is often purposely used with the idea of destroying the endometrium and of causing an obliteration of the uterine cavity. (See Atmocausis.)

Amenorrhea Due to Nervous or Mental Conditions.—A change of climate is noted as a cause for temporary cessation of menstruation. In other instances shock, worry, psychic excitement, or mental disease produce amenorrhea of shorter or longer duration. The amenorrhea is probably the result of some alteration of metabolism, and is to be referred in some cases to functional involvement of some of the ductless glands; among them, the ovaries. Koblanck finds that in many cases of amenorrhea masturbation is practised. These include married women, many of whom have borne children. The duration of the amenorrhea varies from three months to several years. The tendency to masturbation is especially strong at

the time for menstruation. Attracted by the observation of Fleiss, he noted that many disturbances in the menstrual function, especially dysmenorrhea, are associated with circumscribed swellings of certain nasal areas, namely, the anterior end of the lower turbinated bone and the directly opposite area of the nasal septum. He found that this was produced by strong sexual excitement unaccompanied by the relief resulting from physiologic orgasm. For the treatment of amenorrhea in these cases the stopping of the masturbation is necessary.

THE TREATMENT OF AMENORRHEA

The treatment of amenorrhea is directed chiefly to the cause, and consists most frequently in improving the general physical condition and in promoting increased blood-supply and hyperemia in the pelvis and uterus. Due regard must be paid to the interpretation of those cases dependent on disturbances of the ductless glands. Basedow's disease and aberrant Basedow's disease demand, in addition to special treatment, the use of ovarin and antithyroidin. Incipient tuberculosis must be looked for and distinguished from chlorosis. Among younger girls the conditions most frequently met with are anemia, chlorosis, obesity, and uterine hypoplasia. Chlorosis is to be treated by iron, arsenic, ovarin, etc. (See Puberty.) Hypoplasia is frequently present in chlorosis and is very frequently present with obesity. The condition rights itself and menstruation is established in the vast majority of cases by methods which aid the natural development of the body and of the pelvic organs. Anything which aids this process is to be commended.

℞. Ovarian Extract ..... gr. v
Acidi Arsenosi ..... gr. $\frac{1}{30}$
Massa Blaud ..... gr. iij
Phenolphthalein ..... gr. ss
Ft. tal. caps. no. xxx.
S.—One t. i. d. p. c.

℞. Liq. potassii arsenitis ..... ℥j
Ferro-mannin ..... ℥vj
M. S.—℥ij t. i. d. p. c.

Constipation must be overcome by regularity, enemata, liberal ingestion of water, milk of magnesia, and mineral oil.

Open-air exercise is essential; salt baths are valuable, but they should not be very warm. The diet should be generous and is to be restricted only in the case of very obese patients. In those anemic, younger unmarried girls in whom menstruation appears late or is irregular, a good combination consists of a capsule containing 4 grains of Blaud's mass, $\frac{1}{30}$ gr. of acidi arsenosi, and 5 grains of ovarin, given four times a day for several weeks or months. Drugs which have stimulative action on the uterus and which may be given for long periods are ovarian residue gr. v, three or four times a day; pituitary posterior gr. $\frac{1}{2}$–1 several times a day. When possible, very hot vaginal douches should be ordered and continued for weeks. (See Hygiene of Puberty.)

The treatment of amenorrhea encourages the production of a flow of blood toward the uterus. This may be done by sea baths, swimming, and exercise. Warm sitz-baths (90° to 105°, ten to thirty minutes) and hot foot-baths may be given. Short cool sitz-baths, 50° to 65° F., one to five minutes, or the ice-bag to the lower vertebræ for one-half hour are effective. Carbonic acid gas baths are of value. Much may be accomplished by the regular use of the galvanic current, the negative eletrode being introduced into the uterus, and using 8 to 15 milliamperes for five minutes twice a week. A capsule containing ovarian extract gr. v, whole pituitary gland gr. v, thyroid extract gr. $\frac{1}{10}$ may be given for months t.i.d. When the symptoms of menstruation appear, four capsules are to be given daily. Thyroid extract, gr. $\frac{1}{4}$, combined with ovarian extract gr. 5, given in capsules before each meal, often proves of great service in these cases, if obese.

Acquired amenorrhea, which is so often noted in many obese women from the twenty-fifth year on, is a condition extremely difficult to correct. Coincident with obesity there takes place a gradual atrophy of the uterus. Treatment directed to the reduction of the obesity rarely has any effect on the amenorrhea. In such cases ovarin tablets, 5 grains each, four times a day, should be administered for months, combined, unless contraindicated, with gradually increasing doses of thyroid extract. The amenorrhea resulting from lactation atrophy

demands general constitutional stimulative treatment, the use of Nauheim baths, hot vaginal douches, and in some cases scarification of the cervix. Electricity, as noted above, should be used. In such cases, too, the combination of ovarin, iron, and arsenic post-pituitary and small doses of thyroid is of greatest importance.

The amenorrhea resulting in the form of climacterium præcox, sometimes without constitutional symptoms and sometimes with them, likewise demands general constitutional treatment. The amenorrhea due to shock or associated with an altered mental state should be treated by constitutional methods, the treatment belonging to the realm of neurology.

Masturbation must be stopped. Atresia must be corrected by surgical measures.

The only dietetic method of reducing fat consists in the proportionate diminution of the sum of calories in the food. The best results are obtained by selecting from the various series of diet prescriptions the particular articles best suited to the individuality of the patient and the surroundings in which she is placed. In some cases the limitation of food supply would be followed by injury or collapse; favorable results can be expected only by a gradual habituation to a greater exchange of energy. In the thyreogenetic cases the indications are for the administration of thyroid-gland substance. In the pituitary type of obesity the administration of pituitary extract, either anterior lobe, posterior lobe, or whole gland is far from specific in effect. Thyroid plus whole pituitary gland plus proper diet does often give excellent results.

DYSMENORRHEA

In normal menstruation we are concerned primarily with the ripening of a Graafian follicle and with the congestion produced by the ovarian secretion. As a result of the action of the ovarian secretion there occurs a hyperemia in all the pelvic structures which is characterized by a dilatation and fullness of the vessels. This change is most marked in the uterus. The uterus becomes softer and larger, its lining thicker and markedly congested with blood, and blood extravasation takes place in the superficial layers of the mucous membrane. Blood is extruded into the uterine cavity and uterine contractions force it out through the cervix. The tubes are also congested during the menstrual period, but bleeding from the mucous membrane of the tube very rarely takes place.

The pre-menstrual stage begins eight to ten days before the bleeding and gradually increases up to the time when blood is first poured out. A painless normal menstruation implies that there is normal ripening and bursting of a follicle; that there is congestion in a uterine wall which is not inflamed, infiltrated, or sclerotic; that the mucous membrane can readily become swollen and take up the blood which is extravasated; that the capillaries and vessels are of normal caliber; that the uterine cavity is large enough to permit swelling of the mucous membrane; that the menstrual blood flows out easily through the cervix, and that the congestion in the various pelvic organs is not opposed or limited by inflammation or adhesions.

A normal menstruation is painless. There is naturally a slight feeling of weight in the pelvis with some pressure and some sensation of weight in the region of the ovaries. Every definite pain occurring during or immediately before menstruation is to be considered as dysmenorrhea.

Definition.—By dysmenorrhea is meant the process of menstruation accompanied by pain. It represents no disease, no pathologic entity, but is onlv a symptom which may be due to

various diseases or abnormalities in the genital tract. The diagnosis of the cause of dysmenorrhea is extremely difficult in many instances because there are frequently no alterations which can be recognized by palpation. Often the diagnosis depends upon nonpalpable changes of an organic or nervous nature. In every instance anatomic or functional changes must be sought for which influence the course of the menstrual process.

Menstruation is not a process which takes place in the uterus and ovaries alone, for the pre-menstrual congestion affects all the organs in the pelvis, as well as the central and peripheral nervous system, and the various organs of the body dependent on them for their nerve-supply. Dysmenorrhea in its broadest meaning includes all the disturbances of a physical or mental nature; but when strictly considered, concerns only those symptoms which play their rôle in the small pelvis (Winter).

True dysmenorrhea is an expression of processes which take place in the uterus. Uterine dysmenorrhea is in all probability often due to small recognized or unrecognized myomata situated near the cervix or in the wall of the uterus or near the mucous membrane. It is frequently due to inflammatory processes involving the endometrium and the uterine wall, resulting in a large uterus. Pronounced underdevelopment of the uterus (infantile uterus) is often responsible for dysmenorrhea. In a few instances it is due to an acute anteflexion, and possibly in some cases to marked retroflexion, either of which may produce a great degree of obstruction at the internal os. In the majority of cases, however, bimanual examination does not divulge the changes which are responsible for the painful menstruation. Most cases of uterine dysmenorrhea, then, do not show palpable lesions. They are due: (1) to hypoplasia of the uterus; (2) to mechanical or spastic obstruction in the region of the cervix; and (3) to inflammatory changes in the endometrium or the uterine wall, without enlargement of the uterus.

The annoyance felt in uterine dysmenorrhea is, in some cases, *pain in the back*, in other cases pain in both sides, sometimes a feeling of pressure in the pelvis; in other cases there is extension

of pain into the legs, in most cases there are colicky pains in the uterine region. The characteristic of these pains is that they are intermittent, for the essential element in the production of uterine dysmenorrhea is contraction of the uterus.

Hypoplasia.—Hypoplasia of the uterus is an extremely frequent cause of dysmenorrhea. During the pre-menstrual period, the ten days immediately preceding the appearance of blood, the superficial capillaries become greatly dilated. Serous infiltration of the endometrium separates the meshes of the stroma and is accompanied by a gradual but decided dilatation of all blood-vessels and lymph-channels. The glands become larger and wider, being often filled with secretion. The swelling of the mucous membrane, the dilatation of the blood-vessels, the production of round cells, and the growth of the superficial layer of the endometrium produce the so-called decidua menstrualis. The endometrium is at this period from 5 to 7 mm. in thickness. In hypoplasia the vessels of the uterus and its lining are filled with blood by the pre-menstrual congestion, but the vessels are small and do not take up the blood readily. The cavity of the uterus is too small to permit of a normal swelling of the mucous membrane. Increased tension in the small vessels causes tonic contraction or cramp in the uterus. The congestion, during the few days before the appearance of blood, comes to its climax with the greatest of difficulty.

Hypoplasia is frequently found, especially in young, chlorotic, anemic girls with delicate physique, or in obese girls. Dysmenorrhea is generally experienced from the first establishment of menstruation, but it does not always develop in this manner, sometimes first appearing after menstruation has continued for a year or two, when the menstrual congestion gradually becomes greater. There is generally a history of late menstruation. The pains begin several hours or days before the bleeding; in other words, at the beginning of or during the pre-menstrual congestion, and not infrequently recur at various periods during the flow. The slighter the bleeding, the greater the dysmenorrhea. It almost never occurs for the first time after marriage, but, on the contrary, frequently improves after marriage, and after labor. On examination, the

diagnosis is aided by the finding of a small uterus, by recto-abdominal palpation, by vagino-abdominal examination, by the use of the sound and by pneumoperitoneum radiography.

Mechanical Dysmenorrhea.—In dysmenorrhea due to mechanical causes there is an obstruction to the outflow of menstrual blood. The period during which blood is expelled is designated as the menstrual period. The superficial capillaries are greatly dilated, and an extrusion of blood-elements, not dependent on a bursting of the capillaries, goes on for several days. The bleeding occurs partly through diapedesis and, in profuse bleedings, through rhexis. There is little or no destruction of the mucosa, only a very slight fatty degeneration of the epithelium of the uppermost layer, so that in the excreted blood relatively few epithelial cells are found. The first stimulus to bleeding is due to contraction of the uterus, which at the height of congestion is possibly accompanied by contractions of the tube. During menstruation the uterus is larger, and in the first few days following, likewise soft and flabby. The relaxation lasts longer than the bleeding. A spontaneous dilation of the cervical canal takes place and is greatest on the third or fourth day. This dilation occurs irrespective of the amount of blood discharged, whether the menstruation be painful or painless. The blood thrown off is mixed with the mucus of the uterus and cervix, and later with the acid secretion of the vagina, and this is one reason why it coagulates less easily than other blood. Whenever the menstruated blood finds obstruction to its outflow through the cervix, exaggerated uterine contractions result. Excessive uterine contractions produce uterine colic when the outflow of blood is obstructed or rendered difficult. The position of the uterus in a few cases is responsible for this obstruction. Acute anteflexions are frequently considered the cause of dysmenorrhea, but this etiology is by no means so frequent as formerly believed. If the cervix and fundus lie parallel, then anteflexion is acute enough to constrict the internal os. The greater the bleeding, the greater the pain. Retroflexion, however, is only rarely the cause of such an obstruction. Obstruction is most frequently

produced by stenosis of the cervix. Pain may result with total absence of stenosis, if a large amount of blood is poured out and if the blood clots and is forced out as clots. Such obstruction is rarely caused by the external os, however small. Therefore discission is of little value. Most frequently we are concerned with the internal os. In some cases the obstruction is a real stenosis which barely permits the introduction of the smallest probe. In others the sound enters readily, but obstruction is due to overgrowth of the endometrium at the cervico-uterine junction, which, when congested before menstruation and during menstruation, prevents the free exit of blood. To such a condition the term **cervical adenoids** may be justly applied.

Stenosis of the cervix as a cause of dysmenorrhea should be diagnosed only if it can be demonstrated by a probe or if it follows the symptomatology to be mentioned, or if, after dilation of the cervical canal shortly before menstruation, dysmenorrhea ceases.

Mechanical dysmenorrhea usually depends on cervical changes, and for that reason occurs from the first onset of menstruation. It sometimes begins, however, after menstruation has taken place for a year or two, and grows continually worse. Pain begins very shortly before the appearance of blood and is due to uterine contractions caused by the obstruction to the outflow of blood. In some cases only a narrow probe can be passed through the internal os. In other cases the sound passes, but an obstruction to the outflow of blood is furnished by overgrowth of mucosa at the cervico-uterine junction; in other words, by cervical adenoids. After a certain amount of blood has been passed the pain diminishes or ceases and seldom recurs during the subsequent days. When it does recur, it is usually followed and relieved by a new flow of blood, and may thus continue for three or four days. Dilation three or four days before menstruation relieves the pain with stenosis. Such dysmenorrheas are cured by labor. If the canal is of normal size and no mechanical obstruction is present, the cause of dysmenorrhea is to be sought next in inflammatory

changes of the endometrium, generally of the nature called exudative and interstitial.

Dysmenorrhea of Inflammatory Endometritis.—If the uterus is normally developed and there is no mechanical obstruction, the cause of dysmenorrhea may frequently be referred to inflammatory changes in the endometrium. These changes are interstitial or exudative in their character. There are two forms: one, which is purely inflammatory and interstitial; and the other form, which is inflammatory and interstitial, but combined with it are glandular hypertrophic hyperplastic changes. In these interstitial forms fluor may be a symptom and cervical and other evidences of uterine inflammation or uterine catarrh are noted. But ofttimes no fluor is present. The uterus is extremely sensitive to the sound and the lining is not infrequently found rough when examined by this method. This form of dysmenorrhea usually begins several days before the bleeding, with pre-menstrual symptoms. The bleeding itself is normal with the purely interstitial forms, but with the combined interstitial and glandular the amount of blood lost is increased. The important characteristic of this form of dysmenorrhea is that it is generally acquired. All dysmenorrheas which appear after marriage or which grow worse after marriage, if not due to adnexal disease, are almost inevitably inflammatory in their nature. Here pre-menstrual and menstrual congestion in a uterus with an inflamed lining or wall causes uterine colic. Catarrh is often an important symptom. Inflammation may be present without either hemorrhage or fluor. It is evidenced also by "nervous symptoms of menstruation." The endometrium is then sensitive to the sound. This condition is generally acquired. In many cases there is evidence of metritis, salpingitis, and peritonitis. In those cases in which dysmenorrhea is present from the establishment of menstruation it is to be referred to an infection occurring in childhood or to the infectious diseases of childhood. In certain cases the inflammatory changes can be observed, if the lining of the uterus is thrown off in the condition known as dysmenorrhea membranacea.

Dysmenorrhea Membranacea.—A rare but typical form is dysmenorrhea membranacea. Menstruation is not a process by which the mucous lining of the uterus is thrown off, with subsequent regeneration previous to the next menstruation. It is simply the excretion of blood from the decidua menstrualis, occurring for the simple and sole reason that there is in the uterus or tube no fecundated ovum. In dysmenorrhea membranacea the whole uterine membrane, or more frequently pieces of endometrium, are thrown out at menstruation, accompanied by much pain. Examination by the microscope shows the typical picture of interstitial or interstitial plus exudative inflammation.

In dysmenorrhea membranacea the whole membrane may be thrown out and even the openings at the tubal corners may be seen. As a rule, the membrane is thrown out in pieces. The microscope gives a typical picture. There is always interstitial endometritis; there are scattered groups of round-celled infiltration. The spaces of the interglandular tissue are filled with a finely granular exudate and blood, forming the exudative type. Sometimes large cells are present and produce a resemblance to decidua.

Tubal Dysmenorrhea.—Since congestion occurs in all the pelvic organs at menstruation, pain may originate in the ovaries, the tubes, the peritoneum, and the connective tissue, or may manifest itself as a general nervous alteration if inflammation be present in these pelvic structures.

Tubal dysmenorrhea is due to chronic inflammation of the Fallopian tubes and is often associated with adhesions. Here the dysmenorrhea simply represents an exacerbation of the pain felt at other times. No tubal dysmenorrhea should be diagnosed without the discovery by bimanual examination, or by transuterine inflation with oxygen or carbon dioxid gas, of alterations of their form, size, or position. The annoyance is one of discomfort and rarely one of marked pain. Dysmenorrhea due to peritoneal or connective-tissue involvement implies an existing inflammation in the form of chronic peritonitis or chronic parametritis. These cases simply represent at the menstrual period an increase of the pain more or less constantly associated with the lesions themselves.

Pain due to tubal inflammation is of a gnawing, burning nature, felt in the side. Actual colics usually come from uterine contraction, though they may be due to tubal contractions. In chronic inflammation the pre-menstrual congestion causes pelvic pain, and generally the uterus, tubes, and ovaries are affected.

Ovarian Dysmenorrhea.—Ovarian dysmenorrhea, as a rule, is due to chronic inflammation of the ovary, sometimes with severe degrees of adnexal disease, very often with mild, almost unrecognized forms of inflammation.

In the chronic form of interstitial oöphoritis there is a formation of connective tissue with sclerosis; the follicles are destroyed and the stroma shows fibrous connective tissue. It is not to be doubted that the infectious diseases of childhood may be responsible for such alterations in the structure of the ovaries. Other infectious diseases are likewise a cause of structual alteration. Intraperitoneal conditions are a frequent cause. The peritoneal irritation and peritoneal exudation associated with mild or severe degrees of appendicitis or of tuberculosis result in infection of the follicles and in interstitial inflammation of the ovaries. Upward extension of inflammation from the uterus in the gonorrheal infection of children, and in the subacute upward extension of gonorrheal or other inflammations in adults, is the most frequent cause of ovarian involvement, with or without the production of adhesions. In such cases we often have single or multiple Graafian follicle cysts or small tubo-ovarian cysts.

Retention cysts originate, as a rule, in consequence of chronic inflammatory changes. Through the resulting hyperemia there occurs a serous exudation from the vessels and an effusion of serous fluid into the follicles. In advanced cases the greater portion of the interstitial tissue may be replaced by cysts. The cysts, as a rule, attain the size of a ripe Graafian follicle. The lining of the follicles plays only a passive rôle. Interstitial oöphoritis is the most frequent cause of follicle cysts. The ovary contains numerous follicles of various sizes. Retention cysts are inflammatory cysts in which there occurs a "cystic degeneration" of the ovary, often associated with visible disease

of the tubes and with delicate adhesions. This gross condition is generally bilateral, but the pain is usually unilateral. The entire ovary is distended and its surface is irregular. If the process continues, one follicle may overtop the others, may cause them to atrophy, and may result in the formation of a large Graafian follicle cyst.

Before the expulsion of an ovum from the Graafian follicle, a gradual increase in size of the follicle takes place, depending partly on an increase in the amount of the liquor folliculi. The opening which serves as an outlet for the ovum is formed partly by the thinning of the tunica albuginea by pressure and partly by the chemical or enzyme effect produced by the ripe ovum. In the newly born and in children follicles of the same size exist without bursting, the so-called atresic follicles. The ova are small and unripe, hence the follicles do not burst. Unbroken atresic persisting follicles may occur at various ages in adults. In women in whom the follicles do not open but do degenerate as a result of missed ovulation, there is a lack of ovarian energy and varying degrees of amenorrhea often occur. At and after puberty we judge the vitality of the ovary by its ability to bring its ova to a stage called ripe.

Congestion and tension in the ovary accompany the congestion of the uterus and pelvic organs which results in menstrual bleeding. If an ovary functionates and if its ova are ripe ones, then any change in the structure of the ovary, in its tunica albuginea, or in its nerve-fibers will result in unusual manifestations when Graafian follicles increase in size for the expulsion of ova. This congestion and tension will be experienced as a severe pain in hypersensitive, long-suffering women. Increased tension in the ovaries causes swelling of the mucous membrane of the uterus and may prolong menstruation. Ovulation occurs from four to eight days before menstruation, but it may occur at other periods, as ripe follicles ready to burst may be present at any time.

From inflammatory causes, and also in young girls and women without evidences of inflammation, ovarian dysmenorrhea is very frequently due to a thick albuginea which makes the breaking of a Graafian follicle difficult. No evidences of

adhesions are present about the ovaries. This pain does not necessarily occur at every menstruation. Ofttimes the sensitive ovary can be felt to be enlarged before the Graafian follicle which produces the pain bursts.

In ovarian dysmenorrhea there is shooting, boring, pressing pain in the region of the ovary, frequently extending out into the hips or thighs or up to the ribs. As with any inflammatory condition of the uterus and adnexa, this may represent simply exacerbation of the pain felt at other periods or on examination, or else the pain is felt only before and during menstruation. Nausea is often a marked symptom. The ovaries are sensitive and enlarged and most frequently not adherent. There are many cases where, without palpable inflammatory involvement, severe pain is felt in the region of one or both ovaries during menstruation, the etiology of which ovarian alteration may be attributed to changes produced in their structure by the diseases of childhood.

The diagnosis of ovarian dysmenorrhea implies the finding of palpable changes in an ovary or the finding of a sensitive ovary by bimanual manipulation.

In chronic oöphoritis the ovary is rarely as large as a small egg. It is sensitive and other inflammatory evidences may be present. In making the diagnosis of chronic oöphoritis, the ovary may be felt to be enlarged and to be painful and sensitive on pressure. Care must be taken not to include in this category an ovary containing a Graafian follicle about to burst which gives on a single bimanual examination the evidences of an enlarged sensitive ovary. Repeated examinations must show such an ovary to be constantly enlarged. Small cystic degeneration is evidenced by a hard, tense feeling or an irregular surface. In the smaller cirrhotic conditions of the ovary the cystic consistence is generally lacking. Such an ovary is found only on careful bimanual examination. It may be situated in the normal location of the ovary, but very often it is posterior to the uterus or prolapsed in the cul-de-sac of Douglas. These smaller ovaries are of various sizes and exist with or without adhesions, but may be, nevertheless, structually altered.

Ovarian Neuralgia.—Olshausen has described what is called ovarian neuralgia, in which there are no signs or evidences of inflammation or adhesions. Pain is felt during menstruation especially between the twentieth and the thirtieth years. It is considered a neuralgia because it begins suddenly, lasts a few hours or days, and stops suddenly. By others it is called perioöphoritis or hysteria. It generally implies a structural change in the ovary.

Hyperesthesia of the Endometrium.—There is a form of dysmenorrhea in which the uterine lining is extremely sensitive to the sound. The internal os is likewise very sensitive. Objective evidences of inflammation are absent. This condition is considered as a simple "hyperesthesia of the endometrium." In many cases, however, there is probably an inflammatory interstitial or exudative condition in which other evidences of inflammation are not present, and for that reason the cause in virgins may be attributed to the diseases of childhood.

These are cases in which, according to Winter, a careful local examination shows no structural changes whatsoever, either in the uterus or in its lining. In these instances the dysmenorrhea is referred to excessive irritability of the genitalia and undue sensitiveness of the entire nervous system, so that the pre-menstrual congestion acts upon the uterus and all the other organs with unusual irritation. In the absence of inflammatory symptoms dilatation of the cervix is a very good method of excluding the obstructive form of dysmenorrhea.

Pre-menstrual symptoms result from the pre-menstrual congestion. There is a sensation of pressure or a feeling of swelling in the genito-urinary tract. The patients seem conscious of the presence of a sensitive uterus. There is a desire for frequent urination; there is a sensation of pressure in the rectum; there is pain in the back and in the legs. These symptoms are related to menstruation and its associated congestion. There are other symptoms of a general nature.

Ovarian secretion causes a general pre-menstrual congestion involving the circulatory system, the nerve-centers, and the mucous membranes. The action of the ovarian secretion upon pulse tension, and its effect upon the mucous membranes of the

body generally, are evidenced by the congestion of the vocal cords during menstruation, so that during this time the singing voice may be imparied. The secretion of intestinal mucus is also greater, there is increased perspiration, the lower turbinated bones are swollen, and the eyes suffer limitations in power.

Chvostek, in observing the relations between the liver and glands with an internal secretion, found that in all but 3 of 30 women examined the liver increased in size during the menstrual period, the lower margin of the liver showing an increase in size amounting to one or two fingerbreadths. In all probability the hyperemia in the liver is produced by the internal secretion of the ovaries at the menstrual period. The whole function of menstruation is accompanied also by changes in the activity of the stomach. The secretion and the motility of this organ undergo a great change during menstruation. The acidity of the gastric juice and the free hydrochloric acid are increased. At the same time the motor function is below normal throughout the entire period of menstruation.

The congestion of menstruation is apt to increase any annoyance existing in sensitive portions of the body. It increases the tendency to skin affections; it increases the tendency to excitability, mild hysterical attacks, etc. These effects are due to the perfectly physiologic constitutional congestion which occurs and is associated with menstruation, but which acts with undue force on sensitive nervous systems. The patients are nervous or tired or excitable. They have a restlessness that is sometimes almost maniacal. There is palpitation of the heart; there is a change of temperament which is marked. They are mentally upset and sometimes melancholy. These symptoms are exaggerations of the complaints which even healthy women notice at this time. Such symptoms are not infrequently found with metritis and with inflammatory tubal and ovarian diseases. They are very frequent in women suffering from inflammatory endometritis, in whom, be it said, metritic, tubal, and ovarian changes often escape detection on bimanual examination.

Schauta has called attention to the annoying symptoms noted in organs other than the uterus during menstruation,

and especially in dysmenorrhea; feeling of heat, cold feet, frequent urination, dyspepsia, headache, hysteria, etc. As symptoms of the latter, there is anesthesia of the bulbi, hyperesthesia of certain points in the abdomen, singultus, spasm of the glottis, epileptiform attacks. Recurrences of dysmenorrheic pain are ofttimes enough to seriously disturb the nervous system and to provoke neuroses and psychoses. One of the most important sequellæ is headache, diffuse or of the form of hemicrania. Long-existing dysmenorrhea increases the tendency to the development of hysterical attacks.

TREATMENT OF DYSMENORRHEA

The treatment of dysmenorrhea demands improvement of the general health. Especially is this true of the numerous cases due to uterine *hypoplasia*. (See Treatment of Amenorrhea, p. 299.)

In many of the latter it is feasible to aid the development of the uterus by the use of the electric current. The negative intrauterine galvanic electrode is introduced into the uterus, or the faradic bipolar electrode is used in the uterus. Cases of hypoplasia should be treated by general tonics, by a generous diet, by plenty of outdoor exercise, and by hydrotherapy in the form of salt baths or Nauheim baths. The administration of iron and arsenic is advisable if there is any evidence of anemia or chlorosis. Drugs which have a more or less trophic action on the uterus, such as hydrastis and viburnum prunifolium, may be given for long periods; the fluidextract of hydrastis, 15 minims four times a day, and the fluidextract of viburnum prunifolium, 30 minims three times a day. Whole pituitary gland gr. v t. i. d. may be given for months, combined with thyroid gr. $\frac{1}{10}$ (unless the patient be hyperthyroid). Ovarin (five grains three times a day) should be administered for several months. In some instances this administration of ovarin (gr. v in tablets t. i. d.) is of value, some of the subsequent menstrual periods taking place with greatly diminished pain, but rarely does this early improvement last for more than three or five months. The pain felt at menstruation then recurs with previous severity. Pain is diminished by rest in bed during menstruation. The bowels should be kept open, particularly

before and during menstruation. The hot-water bag often gives great relief, and warm and even hot sitz-baths diminish the pelvic pain. A valuable combination consists of 10 minims of tincture of gelsemium, 10 minims of cannabis indica, in 1 dram of compound tincture of cardamon, given at least four times a day.

℞. Tinct. gelsemii..... ℥iij
Tinct. cannabis indic..... ℥iij
Tinct. cardamon co..... q. s. ad ℥iij
S.—℥j t. i. d. and at night.

Its administration should be begun several days before the outflow of blood and continued for several days. If this fails to stop the pain, the coal-tar products are of value. Only the most severe forms are to be relieved by hypodermic injections of morphin. For quieting the associated nervous annoyances hyoscin hydrobromid, allonal, and strontium bromid are of importance.

The dysmenorrhea due to hypoplasia of the uterus often improves after marriage through the trophic effect of ovarian stimulation, and, of course, disappears after childbirth.

The treatment of dysmenorrhea depends largely upon the cause. It goes without saying that the form dependent on obstruction to the outflow of blood in normally developed uteri, whether due, as it is in some cases, to a marked anteflexion of the uterus, or whether due, as it is in most of such cases, to overgrowth of endometrium in the neighborhood of the internal os, or to a narrow cervical canal, can be corrected only by removing the obstruction which is overcome naturally after childbirth. The diagnosis can be made by gently and carefully dilating the cervix a few days before menstruation. This can be done by the introduction of Weir's sounds of various sizes under strict aseptic precautions, or by introducing into the cervix cotton rolled on an applicator and dipped into lysol solution or sterilized vaselin. Each successive applicator is made larger, to that in the space of ten minutes the cervical canal can be dilated to a fair extent. A thin strip of iodoform

gauze rolled into wick form is then introduced into the cervix and allowed to remain for twenty-four hours, being removed by the physician at the next treatment. This procedure, carried out on two to four successive days before menstruation, relieves temporarily this form of dysmenorrhea and makes the diagnosis, if the cause is as above stated. Electricity is oftentimes of marked benefit (p. 151). Intrauterine conical electrodes are introduced and connected to the negative pole of the galvanic current. The smallest size is used at first, followed by larger sizes as the cervix softens and dilates. Six to twelve milliamperes of current are used.

A 20 per cent. solution of benzyl benzoate, given in 20 minim doses, well diluted, every three or four hours, often gives these patients great relief.

Such cases may be treated by the introduction of the stem pessary, to be worn more or less continually (Fig. 103). By some the wearing of the pessary during menstruation is advised; by others it is removed at this period. Although very good results have been reported, there is certainly an objection to the wearing of the stem pessary. Its presence constitutes an irritation which is likely to produce a more or less continued inflammation in the case of women subjected to the introduction of bacteria through coitus. In cases of cervical catarrh and cervico-uterine infection the wearing of such a pessary is contraindicated.

The operation of curetting and discission offers relief in some cases of "uterine adenoids" not so much through the discission, which does not correct the obstruction existing at the internal os, but more so through the curetting, if this is carried out thoroughly. If the curetting is done so that the adenoid hypertrophy at the internal os is removed, relief is experienced, but very often only temporarily.

A permanent cure of such cases can be absolutely accomplished by a high amputation of the cervix, the cervix being amputated at the level of the internal os. If, after operation, the internal os is kept open and dilated by iodoform gauze, or by a stem pessary introduced into the uterus until healing

takes place without contraction, the cure of the dysmenorrhea is absolute. This operation is contraindicated in hypoplasia and is so radical in character that it should be kept in reserve until all other measures have failed.

During dysmenorrhea relief may be obtained by rest in bed, by the application of hot-water bags, by warm saline enemata, and by the use of very hot vaginal douches.

In those cases in which little blood is lost a course of carbonic acid gas baths is of value. If there is chronic congestion of the pelvis, prolonged cool sitz-baths, 50° to 65°, five to thirty minutes, are of importance during the intermenstrual period, and Glauber's salts should be taken. In nervous and hysterical women, with hyperesthesia of the endometrium, spastic contraction of the internal os takes place, and may result in the formation of small coagula in the uterine cavity. The uterus contracts to expel these clots, which process causes great pain. For treatment of the pain we make use of hot abdominal applications, warm or hot sitz-baths, full baths of a temperature up to 100°, and warm vaginal douches. Here again, benzyl benzoate, 20 per cent. in 20 minim doses, is of great value.

In some cases of dysmenorrhea the coal-tar products must be given for the relief of pain, the best of these being luminal, ½ grain four times a day, or else antipyrin, combined with caffein, 5 grains three to four times a day. Pyramidon, 5 grains, and aspirin, 5 grains, in combination, four to five times a day, with or without codein, are helpful. Apiol, 5 to 10 grains, in capsules, has worked well in the hands of many, often combined with ergot. Dionin (⅓ to ½ grain) in tablets or in solution, several times daily, is an antispasmodic and analgesic worthy of trial.

℞. Aspirin ..... gr. iij
Pyramidon ..... gr. iij
Ft. tal. caps. no. xx.
S.—One every three hours.

℞. Triphenin ..... gr. iiss
Antipyrin ..... gr. iss
Codein phosph ..... gr. ⅙
Ft. tal. caps. no. xx.
S.—One every hour for three doses. Then every three hours.

In extremely severe cases of dysmenorrhea, especially of ovarian dysmenorrhea, antipyrin in hypodermic solution (5 grains) is often of remarkable efficiency, and takes the place of morphin, the use of which sometimes cannot otherwise be avoided. A drug which is of some relief in all forms of dysmenorrhea, especially in the form existing without any diagnosed alteration except uterine hypersensitiveness to the sound, or associated with general nervous phenomena, is bromid in the form of bromid of strontium, 10 grains to the dram of water every three hours. In some cases chloral hydrate, 3 grains, and the fluidextract of viburnum opulus, 15 minims in a dram of simple elixir, taken every hour in hot water for several hours, relieves the pain.

℞. Strontii bromidi..... ℥iv
Elixir pepsini..... ℥iij
S.—One teaspoonful in water every three hours.

℞. Choral hydrate..... ℥iss
Ext. vib. opulus..... ℥j
Elixir simplex ad..... ℥iv
S.—One teaspoonful in hot water every hour for 6 doses.

When associated with an enlarged, fibrotic uterus, ergotin, 2 grains, four or five times a day, should be added. Curetting, however, is often an essential procedure for such cases.

℞. Triphenin..... gr. iij
Stypticin..... gr. iss
Ft. tal. caps. no. xx.
S.—One every two hours.

℞. Triphenin..... gr. iij
Ergotin..... gr. iss
Ft. tal. caps. no. xx.
S.—One every two hours.

In the intrauterine treatment of many cases excellent results are obtained by the use of electricity, the negative pole being applied in the uterus (see Electricity). This good result is not to be expected in the dysmenorrhea due to hypoplasia. In some cases, naturally only those of the most severe and absolutely unbearable type, when all other means have been exhausted, sterilization, by x-ray, radium, or oöphorectomy may be considered.

In the treatment of acquired uterine dysmenorrhea due attention must be paid to the alterations resulting from inflammation; we are concerned, therefore, with the intermenstrual treatment of the cause, wherever localized, and with the treatment of the pain occurring at menstruation. The treatment of the pain demands those drugs, such as the coal-tar products, benzyl benzoate, pyramidon, and dionin, which diminish pain. The intermenstrual treatment demands attention to the cervical catarrh, to the involvement of the endometrium sometimes associated with hyperplasia, to the inflammatory metritis, and to the tubal, ovarian, and peritoneal complications (intravaginal pressure therapy, douches, and hydrotherapy).

The treatment of the pain occurring before and during menstruation in ovarian dysmenorrhea includes the use of ovarian extract, the coal-tar products, bromids, and codein. This pain, so often accompanied by nausea, is often not relieved by such medication. In fact, this failure is important in aiding the diagnosis of structural ovarian involvement. Ovarian dysmenorrhea is so very often considered a manifestation of neurasthenia and hysteria that a great injustice is done to many such long-suffering patients. Even if macroscopic and microscopic changes are slight, that does not alter the fact that it is the ovulation and menstrual congestion in the ovary which produce the steady, constant pain. If the pain is severe enough and of sufficient duration to undermine the patient's nervous system, and if general and local treatment fails to improve the local annoyance, removal of the involved ovary is essential to prevent many such cases from becoming nervous wrecks. In most of these cases a varicose condition of the broad ligament is present. The ovary, tube, and upper half of the broad ligament and the ligamentum infundibulo-pelvicum must be removed. The appendix should be removed at the same time. In those cases in which large amounts of blood are lost, and in which pain is increased by the expulsion of clots, treatment directed to the diminution of the amount of blood lost is an essential factor.

The treatment of dysmenorrhœa membranacea is thorough curettage.

Schindler studied experimentally the behavior of the rabbit uterus in the living animal under various stimuli. He showed that the uterus possesses the property of automatic, intermittent, and regular contraction independent of the central nervous system. The adnexa and the ligaments possess likewise an automatic rhythmic peristalsis. Mechanical, chemical, and thermal stimuli increase the intensity of the automatic movements. The response is more intense with heat stimuli than with mechanical or chemical. Violent movements are set up by the injection into the cornua of the uterus of a solution of silver nitrate or other silver salt. It appears to him that vaginal douches, rectal enemata, cauterization, etc., may increase the automatic peristalsis or antiperistalsis of the uterus. Schindler states that peristalsis alone is able to cause regurgitation of pus. The practical conclusion of his study is the necessity for keeping the uterus quiet in all inflammations. Atropin he believes to be a drug which arrests the automatic movement of the sexual apparatus and thus tends to limit the spread of infection. Its use would, therefore, be indicated in certain cases of dysmenorrhea.

Believing that the posterior pituitary is responsible for uterine spasm we administer anterior pituitary gr. v t. i. d. for months.

CONSTITUTIONAL DYSMENORRHEA

The idea that the ovaries, by reflex nerve stimulus, are responsible for menstruation is obsolete and no longer held. Menstruation results because no fecundated ovum takes its place within the uterus after the ovarian secretion has caused a thickening of the mucosa in preparation for the nidation of the ovum. As a result of menstruation the mucous membrane reverts to its former size and state, and a few days before the next awaited period undergoes, as a result of ovarian secretion, the same changes in preparation for nidation.

These local phenomena, resulting through the selective action of the ovarian secretion, are associated with phenomena in other parts of the body, resulting from or roused by the same or other hormones secreted by the ovaries. These phenomena

produced by the ovarian secretion partake of the nature of congestion and hyperemia, with increase of vascular tension, affecting particularly mucous and serous membranes and the glands and glandular structures of the body.

There is an increase in the blood-pressure seven to ten days before menstruation. Patients often complain of headache, colicky pains in the abdomen, drawing pains in the back and pelvis down into the thighs. In a nervous patient uterine contractions may increase up to the degree of spasticity, resulting in dysmenorrhea, perhaps associated with an existing hypersensibility. Menstruation may affect the eye and lids in many ways; may affect the ear, the digestive tract, larynx. There may be periodic toothache, labial herpes, epigastric pain, loss of appetite. The premenstrual period has a bad effect on ulcer of the stomach. The skin changes, such as chloasma, erythema, eczema, urticaria, nervous skin swellings, etc. are frequently observed.

Involved in this constitutional reaction, ofttimes visibly enlarged, is the thyroid gland. It is a matter of common observation that the neck enlarges and the thyroid swells during menstruation and during the early months of pregnancy. In pregnancy we have, as causative factors, the corpus luteum and the trophoblast; in the premenstrual period we have only the ovarian secretion, that produced by the follicles and the interstitial gland. This idea of interrelation and antagonism between ovary and thyroid appears to be generally accepted; they stimulate each other, and, at the same time, are probably antagonistic.

The reaction of the individual to the premenstrual cumulative influence of the ovarian secretion follows different types—some patients do not know from any symptom at all that menstruation is approaching; others show the local pelvic phenomena of congestion, discomfort, or pain; others have a constitutional alteration, characterized by a dull, heavy, tired feeling; a goodly proportion show symptoms of irritation, and constitute the excitable type. The reasons for these different types are to be found, naturally of course, in the character of the ovarian secretion, in its relation to other secretions, and in

the sensitiveness of the organism that is being played upon, so to speak. In some patients there is very little constitutional congestion produced by ovarian secretion, and very little alteration in any of the mucous or serous membranes; other individuals are possessed of a placid, nervous system, in many ways almost insensitive to such changes. In certain women the thyroid is scarcely stimulated by the ovarian secretion, or reacts too slightly, if at all, to its cumulative influence; in others, the faintest beginning of ovarian premenstrual activity is immediately followed by a response of the thyroid, in the form of actual or relative over-activity.

The reaction of an individual to the premenstrual phase is a fairly good indication of the sensitiveness of that patient's nervous organization at that particular age, or of the stability of that patient's nervous system. Whether this is due to either of the two gradations, too much ovary or too much or too little thyroid, it is an index of considerable importance.

Some severe cases of premenstrual constitutional annoyances are found in what might be called "nervous," "neurotic," or "neurasthenic" individuals, and this "nervousness" is in many cases nothing but mild hyperthyroidism, evident, too, in the intermenstrual periods. We are concerned also with that type which is relatively free, in the intermenstrual periods, from "nervous" symptoms.

Preceding the menopause age and stage, instances of constitutional dysmenorrhea become rather frequent. There is the type of case in which the annoyances were present to a greater or lesser extent for years from puberty on, or else developed at a later period, or came on after marriage, or were aggravated by various circumstances. Then comes another and important type, the cases into whose histories these annoyances appear as a new process. These patients in their earlier years had slight, if any, premenstrual annoyances. As they approach the period of life when they look forward to the menopause their menstruation continues, even grows stronger, with or without intervals of amenorrhea, and marked cyclic states of irritability appear. These cases are, in a large number of instances, hyperthyroidism; some of them are cases of actual

or relative hypothyroidism, for we find instances of the opposite type, too, where a phlegmatic and depressed state results, a condition often due to hypothyroidism. The cause of this dysthyroidism lies in the thyroid and ovaries. Either the latter functionate with marked energy, or overshadow the thyroid activity, or they actually overstimulate and rouse the thyroid gland, or else they work with less than their former power, but the thyroid fails to regress with equal degree, and a state of cyclic hyperthyroidism results.

The administration of thyroid gland extract between menstrual periods and before menstrual periods, serves to aid in making the diagnosis. In the hyperthyroid cases the premenstrual annoyances are brought out in the intervals, or are brought on earlier, or are accentuated by the administration of thyroid extract. Among the medical methods, preparations of bromids, and of valerian and not infrequently ovarin, help to diminish the annoyances. In the hypothyroid or hyperovarian type small doses of thyroid are of specific value. In some of the hyperthyroid cases small doses of allonal and belladonna are absolutely necessary to give the patient relief, not so much from their pain and discomfort as from the irritability and ofttimes almost maniacal restlessness which typifies these hyperthyroid cases. In the hypothyroid form, or hyperovarian type, thyroid should be given. It should be used in doses of $\frac{1}{10}$ to $\frac{1}{4}$ of a grain, three times a day, unless there is a distinct indication for a larger dose.

The fact that patients who have never had these annoyances in their earlier years, and that patients who evidence at times the symptoms of myxedema, acquire at later periods, and most particularly in the preclimacteric stage, these constitutional nervous phenomena, show that at that period there is decided susceptibility to alterations in the balance between thyroid and ovaries. This lack of balance between thyroid and ovarian secretion, and probably in very many instances a malrelation between other glands, especially the hypophysis, is of great importance. Too much ovarian secretion can cause congestive symptoms associated with irritability. It is common knowledge that the change of life, as the laity call it, is a

critical period. It is not sufficiently recognized that the premenstrual period is often quite as critical. Are these cyclic annoyances to be explained simply on the theory of congestion and increased tension produced by the ovarian secretion, or do other elements, influenced by the ovarian hormones, play an important part?

The change in gland relations which occurs at puberty, at which time minor thyroid annoyances are frequent, the thyroid phenomena at menstruation, during pregnancy, in association with ovarian affections, and during the climacterium, find a parallel in the fact that the more typical diseases of the thyroid, myxedema and Basedow's diseases, are eight to ten times as frequent in women as in men. No satisfactory explanation for this has yet been given. It seems plausible that the instability of the relation which the thyroid bears to the ovaries and uterus makes the thyroid more susceptible to the causes, whatever these may be, which produce these same diseases in a far smaller proportion in men.

The monthly play produced on a woman's nervous system by the premenstrual ovarian stimulation causes, either of itself or, in many cases through an exaggerated response on the part of the thyroid at these times, a group of nerve phenomena like those in hyperthyroidism, to which may be given the term constitutional dysmenorrhea.

Some patients are depressed almost to the verge of melancholy before each menstruation. They are sluggish in thought, indifferent to their surroundings. There is a mental inertia, they are inclined to be sleepy and drowsy, and awake without a sense of well-being. Pulse is slow, there is a sensation of cold. They constitute the phlegmatic type, and are the opposite of the type to which I desire particularly to draw attention as the more frequent.

There is in this other and important class of patients a nervous excitability in the premenstrual phase, an irritability, and a restlessness that is almost maniacal. The patients cannot keep quiet, find it impossible to lie down or rest, are unable to keep their minds on any one subject. They have not the patience to take part in conversation, or to listen to any

talk or information. They realize that their train of thought is unusual. They have a sense of heat, and complain of burning sensations. There is a tremor about the hands, and the knee-jerks are exaggerated. They sleep badly, and have a pulse of 90 or more.

There is another class of patients, in whom there is a play between hypothyroidism and hyperthyroidism. The symptoms of hypothyroidism may seem to be manifest between menstruation, only to be changed to the type of hyperthyroidism before and during menstruation. We must dissociate that type suffering from well-marked annoyances of probable hyperthyroidism at all times from the type where the hyperthyroidism is characterized by its premenstrual periodicity.

Perhaps the thyroid undersecretes in many cases at first producing, perhaps, physical weakness, tendency to fatigue, diminished sweating, loss of hair, dysmenorrhea, etc. It is possible that such evidences of diminished thyroid function, associated in some cases with muscular and joint pains, may precede or end in or complicate a change from hypofunction to hyperfunction; in other words, a lesion produced in the thyroid, and resulting in lowered energy of the gland in part, leads to an attempt at compensation, and results in symptoms quite different from the early ones of depression. This view of hypothyroidism, associated with the early stages of hyperthyroidism, may account for the improvement obtained by thyroid treatment or by the use of iodin in cases of apparent hyperthyroidism. (Dock.)

Mild forms of hyperthyroidism, which resemble neurasthenia, are very frequent. On the other hand, in many neurasthenics there is overactivity of the thyroid. Just as the larger number of cases of hyperthyroidism are transient, and recover rapidly with appropriate medication, so many of these cases of so-called constitutional dysmenorrhea are cyclic hyperthyroidism and may be benefited or cured.

It must be remembered that various emotions and mental stimulation rouse the thyroid to activity. The same is true in the sexual sphere, and holds good for some of the diseases of the genitalia. Alcohol, coffee, tea, iodids, and arsenic stimulate

the thyroid. The thyroid is quieted by rest, freedom from sexual excitement, and by the relief of pelvic congestion and pelvic pains. A milk diet, the glycerophosphates, ergot, and especially the bromids, luminal opium, and belladonna, are of great service. In certain cases ovarin works very well.

The uterine lining is acted on by the ovaries, probably by the follicle secretions. Some of the cyclic phenomena, occurring in the uterus as part of the normal process called menstruation, are due to the interstitial gland. The uterine lining reacts on the ovaries, too, for, if the uterus is removed, ovarian secretion gradually diminishes and ofttimes ceases long before the end of two years. The lining of the cervix and uterus and their hormones react on the ovaries. When a fecundated ovum is present, it stimulates the ovary to the production of a corpus luteum, and the corpus luteum still further stimulates the decidua and uterine growth. We are certain that the relation of the thyroid to the ovary sensitizes the thyroid gland, and that the relation between the uterine lining and the ovary sensitizes the ovary

If we remove the endometrium, we take away one of the elements which react on the ovary. If we can make these patients cease menstruating and leave the ovaries behind, the oversecretion of the ovaries and the cyclic response of the thyroid seem to be markedly weakened and usually removed, and the reaction of the ovaries to the endometrical hormones is done away with. I know only one way of preserving the ovaries, for a time at least, and putting a stop to menstruation, and that is to remove the uterus. My list of operative cases of this type at present is not large enough to go into an extensive discussion of the subject. I am, with each year, more and more convinced that hysterectomy, especially vaginal hysterectomy, whenever possible, offers, in a large number of such cases, relief from annoyances which not infrequently persist for years, and which may bring patients, to say the least, to the verge of invalidism. I can see no theoretic objection to the procedure. It spares the patient the oft-associated loss of large amounts of blood which, in itself, is a factor worthy of consideration.

In hundreds of cases of real hyperthyroidism the thyroid is removed in part, or its blood-supply is diminished by operative procedure, when the indication is by no means one of life and death but only one of comfort. Why should not the same view of eventual surgical relief hold good in the type of constitutional dysmenorrhea which I have mentioned?

This type of cases referred to here cannot be properly studied or appreciated in dispensary practice. They seem to affect patients in the higher spheres of life, and require long-continued observation to thoroughly understand the type of annoyances, to make the diagnosis by observation and by the use of thyroid or ovarin, to see the effects and improvements obtained by local treatment and the elimination of irritations.

It has been said that no uterine hormone has ever been demonstrated. It is impossible to confine ourselves, in a theoretic argument, or attempt to come to a logical conclusion to facts absolutely demonstrated in the laboratory or by animal experimentation. Besides, there are hormones which produce an immediate result, such as adrenalin, or which give a quick response within a few days, such as thyroid. The ovarian hormones and the uterine hormones do not act so promptly, even when both ovaries are working in the human economy; it takes them twenty-eight days to produce their cyclic uterine alterations, and if the hormones of the uterus do respond and react on the ovary it is probably only an activation of the ovarian secretory function, all of which are points which animal experimentation or human observation can clear up with difficulty in such a direct and rapid manner as to prove that these hormones do exist. Besides, the ovary possibly possesses other hormones than the products of the follicles or luteum secretion (interstitial gland).

A point of great importance is the answer to the question, Why does ovarian secretory activity diminish after removal of the uterus? Now, it is a fact that scarcely a single secretory gland can be removed experimentally, in whole or in part, without involving the other glands of the body in the way of hypertrophy or atrophy. This interrelation between the glands is very complicated. If removal of the uterus, and

with it its lining, does produce such a result in the ovaries, then, whether uterine hormones have been demonstrated or not, it must be apparent that a failure of the uterine elements to react on the ovaries deprives the ovaries of a certain stimulus which keeps up or activates their function.

If a too thorough curettage be done, or if any intra-uterine manipulation be carried out which ends in a cessation of menstruation, and gradual, temporary, or permanent amenorrhea, why haven't we the right to say that something has been removed from the uterus which has a stimulating action on the ovary, the ovary underfunctionates, fails to restimulate the uterus sufficiently, and by this diminution of interaction ovarian and uterine atrophy results? The same idea holds good, in all probability, in lactation atrophy.

It has been said that the thyroid is arbitrarily selected as the cause of these annoyances, and that the hypophysis plays a more important part. No one can deny the importance of the hypophysis. In childhood it is an important factor in promoting growth, and lack of it inhibits development, both of the body and the genitalia. In adult life too much hypophysis causes acromegaly; too little hypophysis causes dystrophia. The hypophysis is intimately connected with the development of the sexual apparatus. Its influence is altered during pregnancy, but all these changes are of a slower type; they probably take weeks or months to produce their annoyances, and they are not at all cyclic, so far as we know at the present time. But the ovary and its relation to the thyroid represent an apparatus in a continual state of changeable relation, and that changeable relation is cyclic, and is one of the responsible factors in making women the weaker sex. Why is it universally recognized that the thyroid has a most intimate relation to the genitalia; it is practically a sexual gland. There are well-defined symptoms of hyperthyroidism and hypothyroidism. In oversecretion of the thyroid we have the greatest variations from typical cases of exophthalmic goiter to cases without the exophthalmos, without the marked goiter, without the tremendous tachycardia, down to the forms characterized by nervous irritability, by digestive annoyance and only moderate

amounts of tachycardia. Some of these eventually develop symptoms which makes the diagnosis absolutely certain, others improve so rapidly that our first diagnosis seems afterward to have been only a suspicion. Many of the cases are masked, and may be developed by irritation or by the administration of drugs given for therapeutic or diagnostic purposes. One must not be influenced by just a few symptoms which are present, nor should the diagnosis be excluded because a certain number of symptoms are absent. When viewed from the psychic sphere alone, the mental phenomena of undersecretion of the thyroid and oversecretion of the thyroid resemble each other, yet attention to other points of diagnosis usually aids in making the differential distinction eventually, and then, after all, the administration of thyroid eventually gives us the clue we want. In the same way we must depend upon long observation, upon the study of minute points, on an observation of the individual in the interval between menstruation, on the effect of drugs, and local therapeutic measures in making a diagnosis of these premenstrual cases. Many of them are simply due to overstimulation by the ovarian secretion itself, and it has been my desire to attract attention to the necessity of distinguishing between such cases, and cases where the annoyances are due to the thyroid gland which, hypersecreting or not at other times, is aroused to overactivity by ovarian stimulation. And we must not overlook the type where an actual, or relative, hypothyroidism is concerned in the premenstrual and menstrual phase. Then, again, comes the class of cases where the relation between ovary and thyroid is so unstable that at times there is too much thyroid and at other times too little; then, finally, comes the class where we may be dealing with an altered character of the secretion. In gynecology we have been assuming for years that the sexual organs, through reflex channels, have dominated a woman's physical and nervous makeup. Lacerations of the cervix have been operated on, retroflexions of the uterus have been corrected, prolapse of the ovary has attracted great attention, and various anomalies of the uterine lining have been considered, all of them, by reflex channels, as the cause of headaches, palpitation of the heart,

nervousness, irritability, indigestion, and mental diseases. There is no objection to surgeons doing all the work they wish on the internal and external genitalia for mechanical and other reasons, but, as common-sense physicians, we must dispel the idea that by reflexes these lesions play their rôle. It is only when we understand the makeup of woman, the relation between ovary and thyroid, the effect of rest, the valuable influence of the correction of congestion; it is only when the mental and psychic stimuli and irritations and the effect of sexual stimulation and deprivation are considered, that we can intelligently understand the nervous affections of womankind and treat them intelligently.

During all the years that the uterus is present, acted on by the ovaries, reacting on the ovaries, relating directly or indirectly to the thyroid, it is an organ of importance only from the standpoint of propagation, and all the nervous annoyances from which women suffer because of the fact that they have ovaries and a uterus are the price which they pay for possessing an organ necessary to motherhood. After motherhood is no longer to be considered, or after the time when motherhood should no longer be considered, the uterus is of no real use. So long as it is productive of no annoyances, all is well. When that uterus is the seat of benign or malignant growths, operation is generally recognized as the proper treatment in the malignant cases, and as the advisable one in a large number of benign type. Then come the cases where the uterus, because of excessive bleedings, or because it is totally prolapsed, produces annoyances which interfere with the patient's comfort and health, and in innumerable cases the uterus is removed. Now, if the uterus because it is present makes menstruation possible, whether it simply takes part in this process, or, by some relation to the ovary and thyroid, stimulates this process, it is nevertheless certain that premenstrual and menstrual annoyances of the type which have been described are markedly diminished, if not entirely removed, when menstruation no longer recurs. Any procedure, whether it is thorough curettage or atmocausis, or the use of radium or the x-ray, which will stop menstruation, without a too sudden cessation of ovarian

function, benefits these patients. If none of these methods are of avail, and the patient's constant or recurrent annoyances are sufficient to make her life miserable, and if we feel, that removing the uterus and preserving the ovaries will improve and cure this patient, then removal of the uterus, especially through the vagina, is a legitimate operation.

Thyroid affections, occurring so much more frequently in women than in men, when of the type of Basedow's disease or myxedema of typical character, teach us that the minor gradations of these diseases are also much more frequent in women than in men. Hence, nervousness of a type in which the thyroid is the important factor, or only a contributing factor, is more frequent in women than in men. Small wonder, then, that a goodly portion of women suffer from annoyances in which the thyroid plays a part, preceding or during menstruation, a time at which the vast majority of women realize that they are put to a severe mental and nervous strain. I have attempted an explanation, theoretic to be sure, of the frequency of thyroid affections in women. I fail to see how logic can lead us to any other conclusion than that the susceptibility of the thyroid to disease is in a great measure due to the fact that its relation to other glands is an unstable one, and that it is hypersensitive to annoyances and irritations of whatever nature. Now, just as eclampsia, even if we haven't found the actual chemical element or elements which produce the disease, is certainly due to the action of cells of the ovum, acting directly or through the medium of other glands, upon the blood and tissues of the body, so the ovary in some way, directly or through other glands, acts on the thyroid, and renders it liable to overactivity, underactivity, or malsecretion. When one considers the phenomena which lead to menstruation, it is impossible to avoid the conclusion that the uterus, by its very presence, and in all probability by elements secreted by its glandular structures, bears an important relation to the ovary, so that in the last analysis the thyroid acts on the uterus directly or through the medium of the ovaries, the uterus acts on the thyroid directly or through the medium of the ovaries or other glands.

Conditions due to hypothyroidism are not so difficult to combat. It is the hyperthyroid cases which cause the trouble.

Any treatment which relieves the patient of pelvic pain between menstrual periods, or relieves dysmenorrhea of uterine origin, corrects congestion and irritative anomalies of which the patient is conscious, or which interfere with ovarian function, is of the greatest value.

Local treatment and general medication can help many of these patients, even though the annoyances may recur at subsequent periods. I have watched some of these patients for many years, and many of them have responded repeatedly to courses of treatment.

Viewed from the standpoint of the medical man, it might be said that these are nervous patients made worse at the menstrual periods. The neurologist might think of them as neurasthenics, irritated by the premenstrual phase. Others might consider them as masked Basedow cases, subject to various degrees of exacerbation at regular intervals. The gynecologist was formerly inclined to attribute annoyances to reflexes sent out from displaced pelvic organs or from altered structural conditions.

As a matter of fact, it really means that the premenstrual phase furnishes an index of the patient's nervous sensitiveness, or indicates how stable is the function of the thyroid, or how sensitive it is to variations in the function of the ovaries and the uterus.

That the ovarian secretion of itself, by its overactivity or underactivity or absence, may cause changes without placing the burden on over- or underactivity of the thyroid goes of course without saying.

It is the cases suffering from menorrhagia, plus these cyclic nerve upsets, that furnish the most marked indication for operative interference.

The annoyances which occur in the climacterium are of various forms. The nerve phenomena show variations from the phlegmatic type to the excitable type. The psychic variations run from melancholic and psychasthenic to maniacal forms. In many cases the annoyances are clearly the result of

changes incident to the climacterium. In others they resemble various forms of mental diseases, and seem ofttimes to have nothing to do with the interglandular upset. Care is of course necessary to separate the forms which are coincident with the preclimacteric or climacteric phase from the forms which are due to the alterations of that period. Some women go through this time of life with scarcely a ripple to mar their good health, while others are miserable and unhappy for months or years.

There are women who are in this so-called change-of-life state (if that term be used to signify an abnormal relation to and between the secretions) during the greater part of their life, or for certain months of their existence, or preceding a few or many or all of their menstrual periods, and who suffer from the same variations, in the way of annoyances, as the class just mentioned, who are about to go or are going into the climacterium. There is too much ovarian stimulation or too little ovarian secretion; there is too much thyroid actually or relatively or there is too little thyroid, or there is a play between these various alterations.

HEMORRHAGE

Causes.—Carcinoma or sarcoma of the vagina is productive of bleeding on vaginal manipulation. Carcinoma of the vagina generally takes the form of flat infiltrations which affect part or all of the vaginal wall. Occasionally vaginal carcinoma takes the form of large tumors of broad extent filling the lumen of the vagina, or of papillary bleeding projections lying on the surface and affecting the whole vagina without deep infiltration. The infiltrating form may extend under the mucosa and gradually involve the whole length of the canal, making it scarcely passable for one finger. Sarcoma of the vagina causes flat ulcerating infiltrations or rounded tumors covered by mucosa. Sometimes there are grape-like bodies. These are occasionally found in children, as well as in adults. Otherwise sarcoma is not to be diagnosed clinically from carcinoma. When ulcerative changes result in erosion of capillaries and vessels, the bleeding is profuse.

Erosions of the cervix are productive of but slight bleedings. Profuse hemorrhage from the cervix usually comes from carcinoma, sarcoma, or myoma of the cervix, and especially from small cervical polyps.

Bleeding from the uterus may depend upon general or local states. There are constitutional *blood-states* in which blood coagulation takes place slowly, and which may lead to loss of much blood from the uterus (scurvy, leukemia, anemia, hemophilia).

Perhaps some instances of bleeding are due to increased vascular tension. Passive congestion from a disease of the heart, lungs, and liver, etc., is supposedly a cause of profuse uterine bleeding. As a matter of fact, however, diseases of the heart are more frequently followed by a diminished flow of blood.

Congestion in the uterine tract resulting in bleeding may be produced by retrodisplacements of the uterus. Retroflexions

are a possible cause, if they occur after abortion or after labor, and prevent the involution of the uterus. Koblanck observed that menorrhagia was often due to masturbation and to disturbances of a sexual character. Sixteen women with menorrhagia and metrorrhagia acknowledged abnormal sexual practices, especially coitus interruptus, due to a desire to avoid conception. The symptoms disappeared with the regulation of the sexual relation. Inflammatory involvement of the pelvic peritoneum causes congestion in the uterus.

In addition to such causes, hemorrhage from the uterus may arise from some involvement of the uterine lining, with or without an enlargement of the uterus; to some structural involvement of the wall, with or without enlargement of the uterus; or to new-growths in the uterus or its cavity, which are, as a rule, associated with enlargement of the uterus.

The Ovaries and Bleeding.—The ovaries certainly are often responsible for excessive uterine bleeding; they are, after all, the cause of menstruation, and the vast majority of cases of relative or absolute amenorrhea are due to involvements of the ovaries, directly or through the influence of other glands or certain diseases. It is therefore logical to expect symptoms of the opposite extreme, with overfunction on the part of the ovaries, if they produce a congestion or hyperemia of so marked a nature that only slight disturbances in the uterus are necessary to result in menorrhagia or metrorrhagia. Some of these cases seem to be due to a too rapid and sudden maturation of the ovary. There is often an hereditary tendency, the patient's mother having undergone similar troubles. This condition may be a family trait, and may represent an inherited instability of the glands of internal secretion. Metrorrhagia may be due to a hyperemia resulting from hyperfunction of the ovaries and may be accentuated by masturbation. The normal uterus, lined with a normal endometrium, resists the premenstrual congestion up to that certain point when menstruation begins. This occurs with marked periodicity, and the flow lasts a certain time and then ceases because the endometrium is bled, the uterine wall contracts, and the particular substance secreted by the ovaries which is responsible for menstruation is thrown

out of the system. If the endometrium is abnormal, especially of the adenoid type, or if the uterus has lost its elasticity, and its contractile power is diminished, then even a normal ovarian congestion may, with perfectly understandable ease, produce menorrhagia or metrorrhagia. These excessive bleedings are observed very often in women in the late thirties and early forties, and they are usually healthy, well-developed women. I have performed a hysterectomy on a large number of them; large enough to have my attention attracted to the fact that they have large, plump ovaries, and I have come to the conclusion that failure of the ovaries to regress at this period naturally prevents the uterus from undergoing atrophy. The associated persistence of marked premenstrual congestion within a uterus of lessened elasticity readily explains the frequent bleedings to be found in the preclimacteric period.

Definition.—Excessive or prolonged bleedings from the uterus, which follow more or less the regular four-weekly rhythm of menstruation, and which are associated with the local and constitutional symptoms of menstruation, are called *menorrhagia*, whereas bleedings which are of an irregular, intermenstrual character are called *metrorrhagia*. The two are so often merged that the bleeding cannot be called either menstrual or intermenstrual, but is called an irregular bleeding (Winter).

In the discussion of those cases in which regular profuse bleedings have occurred for some time, the element of existing pregnancy, impending abortion, ectopic gestation, and placenta prævia can, as a rule, be excluded.

We are dealing in menorrhagia with excessive menstrual bleedings, which, according to Winter, imply *conditions which increase and lengthen the four-weekly congestive hyperemia, or conditions which do not cut this hyperemia short.* Inflammatory conditions about the uterus, fibroids, "endometritis," atrophy or atony of the uterine wall, subinvolution fibrosis, and metritis are to be considered.

Periuterine Inflammation.—Inflammatory involvement of the ovaries is productive of irregular bleedings. Acute pyosalpinx in its earlier stages also causes hemorrhage from the uterus. The existence of parametritis or a stump exudate

causes congestion in the uterine structures and irregular hemorrhages. Sometimes acute or chronic pelvic inflammation or pelvic exudates are productive of prolonged regular bleeding because, in addition to an acute or chronic inflammation of the uterine lining and its wall, there is congestion and exudation about the uterus.

Inflammation of Endometrium.—Involvement of the endometrium associated with bleedings may be also the sequela of infectious diseases, such as typhoid, pneumonia, influenza, scarlatina, etc., which produce structural changes and hemorrhagic endometritis. Chronic endometrial hyperemia is often increased by inflammatory conditions about the uterus. With any inflammation of the endometrium the interstitial tissue is infiltrated with small cells in proportion to the severity of the inflammation. The round cells completely replace the original cells of the interstitial tissue in certain areas, so that gland sections are absolutely surrounded by small-celled infiltration. The epithelial cells of the glands proliferate in certain areas as a result of the increased blood-supply. The small round cells become larger and epithelioid in form through the increased nutrition due to the newly formed vessels present with inflammation. In the early stages, the entire mucous membrane is thickened, there is marked hyperemia, and the endometrium looks extremely red.

Overgrown Endometrium.—An overgrown hyperplastic endometrium, whether the result of such inflammation or of subinvolution after labor or abortion, or of retention of decidua, of the form of the so-called fungoid, hyperplastic "endometritis," is very frequently productive of regular uterine bleeding. The vessels may show no change, they may be dilated, there may be hemorrhage in the tissue, the walls of the capillaries may be thickened, the entire endometrium may evidence so much blood as to deserve the name of apoplexy. The vessels and capillaries of the endometrium may be brittle and show changes of an arteriosclerotic nature, so that menstrual bleeding is controlled with difficulty. With these changes of the endometrium the uterine wall is often altered, but not always thickened.

Changes in the Uterine Wall.—A point of importance is the necessity of considering the affections of the endometrium in conjunction with changes in the structure of the uterine wall. If we are dealing with an endometritis inflammatory in its character, we must consider that the same bacteria or cocci may, and probably do, involve the uterine wall, producing changes there in the character, amount, and structure of the component elements, and that this alteration in the function of the uterine wall has a bearing on the symptoms supposedly or actually associated with the involvement of the endometrium alone. On the other hand, changes in the ovaries (trophic centers) or such changes as are associated with pregnancy in the tube or uterus, may likewise produce alterations in the uterine wall. The important changes in the uterine wall from a non-inflammatory cause are those changes known as *sub-involution*, which means hypertrophic and fibrotic alteration in the uterine wall with consequent modification of the symptoms supposedly or actually associated with alterations of the uterine lining.

There are alterations in the structure of the uterine wall, with or without enlargement of the uterus, which are of a nature like those affecting the muscle of the heart. There may be atony or atrophy of the muscle fibers. The uterine wall is structurally changed by numerous labors and abortions. The elasticity of the muscle fibers is diminished, their place is taken by fibrous connective tissue, there is a new-growth of connective tissue, or newly grown elastic fibers of poor contractile force have appeared. The uterine wall may be infiltrated as a result of acute or chronic inflammatory involvement and there are muscle fibers of poor contractile power or newly formed infiltrating tissue, with consequent inability on the part of the uterus to contract and to close the vessels. As the consequence of numerous labors and abortions, there is found, especially about the climacteric age, an involvement of the vessels characterized by changes in the intima and adventitia which makes them brittle. Such an arteriosclerosis with lack of elasticity and lack of contractility tends to capillary and arterial hemorrhage.

Uterus Not Enlarged.—A change in the uterine lining productive of hemorrhage, with a uterus not enlarged, is the result of a hyperplastic endometrium or of an endometritis both glandular and interstitial, or of a beginning carcinoma. The use of a sound may exclude these conditions if the endometrium feels smooth. *A test curettage must be done if carcinoma is suspected.* The clinical history is of greater importance than the finding obtained by the use of the sound. If the endometrium is not involved, the *uterine wall* may be the responsible factor, through atrophy or atony of the muscle fibers or through sclerosis of the blood-vessels.

In women who have never been pregnant menorrhagia may be due to uterine congestion. In *rare* cases retroflexion may be responsible for menorrhagia. Fibroids when small may cause metrorrhagia or menorrhagia, and even when large only cause menorrhagia if they are interstitial or submucous. "Endometritis" hyperplastica is also a cause. A not infrequent cause in women who have not been pregnant is tubo-ovarian inflammation. In some cases a polyp may be the cause of menorrhagia. These conditions of uterine congestion and displacement, endometritis, inflammation of the adnexa, and polyps all produce exaggerated four-weekly congestion.

Menorrhagia which occurs with retroflexion generally means a congestion associated with subinvolution or with fibrosis, or it may mean "endometritis" hyperplastica, or both. When regular profuse bleedings are associated with a chronic catarrh, inflammatory endometritis or metritis is probable. If there is no catarrh, and if there are no evidences of inflammation, the condition is either hyperplastic endometrium or a structural change in the uterine wall. The use of the sound, the size of the uterus, and the amount of material obtained by a curettage give proof as to which factor is important.

Enlarged Uterus.—With regular increased bleeding from an enlarged uterus it is important to exclude the retention of fetal or decidual structures and the rare occurrence of menstrual bleeding in pregnancy. The other forms of regular bleeding from an enlarged uterus indicate involvements of the wall due to chronic metritis or subinvolution, or to myoma or large

polyps. Though sarcoma and carcinoma generally cause irregular bleedings, the diagnosis should not be made from this irregularity alone.

The subinvolution occurring after labor or abortion, with or without associated inflammation, if not corrected, results in chronic hyperemia, in a large cavity which offers no obstacle to the periodic swelling of the endometrium, and in a muscle wall of diminished contractile power. As a consequence the flow of blood is not arrested and excessive menstruation occurs. Associated with this condition may be dysmenorrhea, which is due either to expulsion of large clots by increased contractions, or else it may be due to inflammatory changes. More frequent than simple subinvolution after a labor or abortion is chronic subinvolution complicated by *fibrosis*, a change which implies the formation of new connective tissue in a uterus which has gone through labor or abortion without complete involution. Here, too, there is a large uterine cavity, there is no resistance to the swelling of the mucosa, the vessels are not compressed by the uterine wall, there is atony of the uterine wall, and there is arteriosclerosis.

Fibroids.—The chief symptoms which fibromyomata produce are increase in size of the uterus, generally with enlargement of the uterine cavity; bleeding, especially in the submucous and sometimes in the interstitial variety, reflex disturbances, pressure symptoms; and pelvic discomfort. (They rarely produce pain, unless incarcerated beneath the promontory of the sacrum, or unless the blood which is poured out coagulates quickly and is expelled from the uterus as large clots.) Fibromata in their growth are surrounded by a zone rich in blood-vessels, but in the fibroid itself the blood-supply is poor. If this zone comes close to the surface of the uterine lining or the mucosa over the fibroid is in a state of hyperplastic development, or it is thinned out, or the surface of the fibroid projects, in broad-based or polypoid form, into the cavity of the uterus, bleeding, which is generally of the form of menorrhagia, may take the form of metrorrhagia. Hemorrhage is most marked in the submucous or polypoid form. In fibroids situated interstitially, and especially subperitoneally,

irregular bleeding is rarely a symptom. These tumors evidence themselves mainly through the increased size of the uterus and through pressure-effects on the surrounding structures, such as intestine or rectum, bladder or ureters, or nerve trunks.

In addition to hemorrhage, which may be of the form of either menorrhagia or metrorrhagia, there may be pain through weight and pressure of the fibroid, there may be dysmenorrhea due to the expulsion of large clots through the cervix, or there are evidences of pressure on the bladder, ureters, rectum, or sacral nerves. Incarceration within the pelvis of uterine and especially of cervical fibroids may compress the bladder, causing great distention of that organ with pain and urinary incontinence.

An interstitial myoma or fibroma, being situated in the wall of the uterus, is covered with muscle fibers. The diagnosis from chronic metritis or fibrosis is difficult if the uterus is small. In chronic metritis the uterus is evenly enlarged, the corpus and fundus are both thickened. If a sound is passed into the uterus and the uterus is palpated through the abdomen, by manipulation of the sound the even or uneven thickening of the uterine wall may be noted. The larger the uterus and the harder the uterus, the more probable is the existence of fibromyoma. The uterus is then enlarged, the cavity is lengthened and widened. An interstitial myoma of the cervix gives an irregular knotty wall. With a symmetrical enlargement of the uterus by a fibroid, the diagnosis from pregnancy in the early months is often difficult, especially from pregnancy with dead fetus. With a living fetus the most important sign is the change of consistence which the uterus undergoes in the course of a few minutes under bimanual examination. The myomatous uterus is usually harder. In the later months of pregnancy the evidences of fetal movements and the beating of the fetal heart make the diagnosis easy.

A differential diagnosis is also to be made from retro-uterine hematocele. The latter, however, becomes harder and harder after the blood has coagulated, causes peripheral adhesions, and is more closely connected with the pelvic wall. In differ-

entiating an intraligamentous fibroid from intraligamentous hematoma it is to be noted that the latter shrinks gradually. With myoma the uterus is enlarged, but in many cases the differential diagnosis is difficult and can only be made after continued observation. A retro-uterine fibroid must be distinguished from the retroflexed fundus by rectal examination and by the use of the sound.

Submucous fibroids, whether broad-based or pedicled, grow toward the uterine cavity and are covered with mucosa. If such a fibroid grows into the uterine cavity, it dilates the uterus and the cavity is lengthened and widened. It stimulates the uterus to contraction, which may cause the fibroid to protrude from the cervix as a fibrous polyp. The submucous type causes profuse bleeding. The uterus is enlarged and round, the portio is felt to pass over into the enlarged uterus. A submucous fibroid often dilates the cervix and the lower uterine segment like a balloon. A differential diagnosis must be made from pregnancy and from metritis. The cervix is dilated during menstruation, and if the finger is then passed into the cervix, a foreign body is felt in the case of a submucous fibroid. This must be differentiated from an ovum or the retained products of an abortion. It must be remembered that an ovum or any of its retained parts may be loosened from the wall of the uterus by the examining finger, whereas a fibroid cannot be detached. A retained placenta may be so firmly adherent as to be diagnosed as fibroid. Mucous polyps are characterized by the fact that they are oval, lobulated and soft, and have a thin pedicle.

Metrorrhagia.—Metrorrhagia is a bleeding of a different type. There is either too short an interval between the menstrual periods, or else the bleeding appears during the intermenstrual interval. It is due to abortion, ectopic gestation, *fibrosis uteri*, arteriosclerosis, fibromyoma, polyps, sarcoma, or advanced carcinoma.

Important causes of metrorrhagia are new-growths (1) associated with pregnancy, an ovum in the uterus or in the tube, or placenta prævia or chorioepithelioma, or (2) tumors not associated with pregnancy, such as polyps, fibroids, sar-

coma, carcinoma. When fibroids increase in size, especially if they are submucous or polypoid, the bleeding may become intermenstrual. Therefore continued metrorrhagia is generally due to actual diseases of the uterus itself. As Winter says, intermenstrual bleeding speaks for permanent structural changes. In numerous cases of this nature we are dealing with new-growths, or with polyps. When an intermenstrual bleeding first takes place and is seen for the first time, abortion and ectopic gestation should be suspected.

New-growths, Including the Ovum.—Many cases of metrorrhagia from an enlarged uterus, aside from those instances due to metritis or subinvolution fibrosis, are due to the presence of new-growths. A carcinoma in the early stages by no means implies an enlarged uterus. *It produces only an oozing and a discharge of sero-sanguineous fluid*, but in the later stages erosion of blood-vessels may be associated with profuse hemorrhage. The same holds good for sarcoma, and especially for chorioepithelioma, in which the tendency to the erosion of blood-vessels is extremely marked. Fibroids which have about them a zone of tissue rich in blood may be productive of great bleeding, especially if this area is situated immediately under the mucosa or if the fibroid thins the mucosa over it. In addition, the presence of a fibroid prevents the uterus from contracting and limiting the hemorrhage. Polyps may cause profuse bleeding from open vessels. So rich is the blood-supply of a polyp that the bleeding may be very profuse. A uterus enlarged by the presence of an ovum which is being expelled or which is retained in whole or in part, or in which a low embedding has resulted in placenta prævia, is a relatively frequent cause of bleeding. So long as the ovum, or part of it, is still attached, vessels or capillaries are open, thrombi do not form, the uterus cannot contract, the bleeding continues. A tubal gestation is almost invariably interrupted by bleeding in the tube, by tubal abortion, or by tubal rupture. This interference with the life of the ovum causes the expulsion from the uterus of the decidua by uterine contractions. Hence oozing, irregular bleeding, and in the later stages the expulsion of decidua occur.

Single Strong Bleedings.—A single strong bleeding occurring for the first time must always be viewed as a possible abortion or as an ectopic gestation, and these conditions must be differentiated or excluded by examination. Such a single strong bleeding, according to Winter, not infrequently takes place as the first menstruation after labor, or the first menstruation after a long period of amenorrhea. Here the history and size of the uterus are of importance. Examination by a sound in such cases shows the uterus to be empty. In this first bleeding occurring after a completed labor or abortion, the large cavity of the uterus offers no obstacle to the swelling of the mucosa, the uterus has not regained its contractile power, and prolonged hemorrhage may take place. The other conditions related to pregnancy which must first be excluded are abortion, ectopic gestation, and placenta prævia.

Ectopic Gestation.—Most cases of ectopic gestation present a group of symptoms preceding the *tragic* stage of the disease sufficiently distinctive to warrant a diagnosis, and since these symptoms are in no way alarming, they are called the non-tragic symptoms of ectopic gestation. The two symptoms of greatest value are: (*a*) atypical menstruation or metrorrhagia, (*b*) pains.

Atypical menstruation of ectopic gestation means the appearance of blood generally out of rhythm with the normal menstrual cycle of the individual. The amount of blood lost may be very much greater, or very much less, than the usual menstrual flow of the patient. It may be continuous or appear with interruptions. It may be darker or may be lighter or more brownish than the usual menstruation. The metrorrhagic blood of ectopic gestation very often has a slippery character almost sufficient at times to diagnosticate ectopic gestation by the effect of such discharge upon the tactile sense.

The colicky sharp pains of ectopic gestation are generally closely attended by the appearance of a bloody discharge from the vagina. If the patient is intelligent, she will at once know wherein the pains and the flow of the present attack differ from her previous and painful menstruations. If the colics are very severe, with steady pains between them, the abdominal walls may be rigid. The colics in the beginning of tubal

pregnancy are often mistaken for intestinal pains. They may not cause the patient to rest more than momentarily from her work or pleasure. Except for brief intervals of an hour, or a few hours or so, *a large proportion of the cases of ectopic gestation pursue their usual vocations during the non-tragic stage without material or prolonged interruptions* (Harris).

Morning sickness and enlargement of the breasts, which are the ordinary symptoms of intrauterine pregnancy, do not belong to the symptomatology of extrauterine pregnancy. Miscarriage is often diagnosed by the patient or another physician. If the patient is still bleeding and has pains, we should be slow to accept such a statement, unless a fetus has actually been seen by some one. Twenty per cent. of the cases of ectopic gestation are subjected to the operation of curettment for the cure of metrorrhagia, the real cause of the metrorrhagia not having been suspected (Harris).

Cullen has called attention to a bluish discoloration of the umbilicus in cases of ectopic gestation, but this sign is by no pathognomonic.

In the non-tragic stage the pregnant tube is usually sufficiently large to be palpated, and possibly also approximately measured by bimanual palpation. A pregnant tube is always tender when squeezed, and may be exquisitely sensitive. The tube may be embedded in blood-clots, or so displaced or partly or completely engulfed in blood as not to be made out.

When any woman after puberty and before menopause who has menstruated regularly and painlessly goes four, five, six, eight, ten, fifteen, eighteen days over the time at which menstruation is due, sees blood from the vagina differing in quality, color, quantity or continuance from her usual menstrual flow, and has pains, generally severe, in one side of the pelvis or the other, or possibly in the hypogastric region, ectopic gestation may be presumed (Harris).

Uterine Abortion.—The symptoms of abortion are bleeding, pain caused by uterine contractions and by dilatation of the cervix, and local cervical evidences of an attempt at expulsion of the uterine contents. The bleeding is either the primary or the secondary factor. It is primary if a hemorrhage takes place which acts as a mechanical factor in separating the ovum.

It is secondary if the ovum dies or is partly separated and, being then a foreign body, the uterus contracts in its attempt to expel it. Uterine contractions continue to separate the ovum, more bleeding takes place between ovum and decidua serotina, and blood is poured out of the cervix. The pain associated with abortion is due to uterine contractions and to cervical dilatation, and for exactly the same reasons as at full term. The uterus contracts close down upon the egg, blood accumulates in the uterus, the uterus contracts to expel the blood, and this process may loosen the unruptured ovum entirely from contact with the uterine wall. Not only the uterine contractions but also dilatation of the cervix produces the pain. The degree of dilatation of the cervix, then, is one of the means of determining whether abortion is progressing or not. Given a uterus which is bleeding, in which pain is slight, and in which the cervix is not dilated, it is probably a case in which the bleeding and the progress of the abortion may cease under proper treatment. If, however, bleeding continues, it threatens the life of the ovum. If the blood which is poured out aceumulates in the uterus in the form of clots, it stimulates the uterus to further contractions. If the ovum is partially separated from the uterine wall, or if the embryo is dead, the uterus naturally reacts by further contractions. Therefore, the continuation of uterine pain and the increasing dilatation of the cervix are indices of an inevitable abortion.

An inevitable abortion is associated with the loss of much blood and of fresh blood, whereas irregular bleeding or the loss of brownish blood mixed with mucus does not indicate immediate danger. When, in addition to the loss of fresh blood, pains come on, and the uterus becomes more tense or becomes harder, the abortion is in progress. If, then, the cervix is open and the internal os admits one finger, the abortion is inevitable.

Hegar's sign is important in those early cases seen for the first time, and in whom pregnancy has not been previously diagnosed; especially so if there is a history of long-continued irregular menstrual periods and if ectopic gestation is suspected. An important aid is the introduction of the finger into the uterus when the cervix is open. In beginning abortion the

finger feels the round ovum more or less cystic. In incomplete abortion the finger feels retained villi or decidua or retained placenta, which are recognized by the fact that they can be peeled off with the fingers. Sometimes such structures are seen projecting from the cervix.

Menstrual bleeding in the course of uterine pregnancy may be due to a double uterus, to endometritis, to the coexistence of a fibroid, polyp, or carcinoma. Spotting or bleeding in the early weeks or months of a pregnancy means endometritis deciduæ or ectopic gestation.

Chorioepithelioma.—Chorioepithelioma occurs from six weeks to three years after labor or an abortion. (It never occurs in a nullipara.) In 50 per cent. of the cases it follows the occurrence of hydatid mole.

The clinical symptoms are: (1) Pronounced uterine hemorrhage recurring even after repeated curettings; (2) very early metastases, especially in the lungs and vagina; and (3) early death through hemorrhage, cachexia, or septic infection. Macroscopically, these tumors are more or less localized, ulcerating, degenerating, hemorrhagic growths, frequently passing deeply into the uterine wall, or through it, with involvement of the peritoneum. Microscopically, these tumors are characterized by hemorrhagic areas, areas of degeneration, the presence of fibrin, and the involvement and invasion of capillaries and large vessels. The diagnosis is verified by the microscope. (See section on Chorioepithelioma.)

Arteriosclerosis and Fibrosis Uteri.—When menstruation becomes profuse and menorrhagia or metrorrhagia gradually develop, and no local changes in the endometrium can be detected with a sound or with the examining finger, we may suspect that one or more of the following conditions are present: (1) Degenerating muscle fibers poor in contractile power; (2) an increased amount of fibrous connective tissue; (3) an increased amount of elastic fibers, thickened and brittle; (4) arteriosclerotic vessels. Age is no criterion, since these changes may occur long before the natural climacteric period. If ergotin, stypticin, etc., are of no avail; if no decided changes in the adnexa sufficient to warrant their being considered the

causal factors are found, and if curetting shows no altered condition of the endometrium; and if, above all, *a thorough curetting does not control the hemorrhage*, then the diagnosis of muscular degeneration, fibrosis uteri, or arteriosclerosis may be made.

Arteriosclerosis.—Arteriosclerosis seems relatively frequent in women in the preclimacteric age. There seems to be a connection with frequent pregnancies, especially if they have followed each other closely. In other cases there is a myomatosis or fibrosis uteri. We know from experience after castration that, on cessation of the ovarian secretion, there is an alteration in the thyroid and certain symptoms of hypersecretion of the hypophysis, the same as after removal of the thyroid. The cessation or hypofunction of thyroid and ovary stimulates the adrenals, an effect which is supported through the hyperfunction of the hypophysis. It is a question whether there is a connection between such changes in the secretion of various internal glands on the one side, and the preclimacteric arteriosclerosis on the other. The vessels of the genitalia, especially those of the uterus, are favorite areas for arteriosclerosis in women. Only in half the cases are signs of arteriosclerosis found in other parts of the body. This arteriosclerosis of the uterine vessels may cause decided bleedings. There may, however, be no changes in the muscle or vessels to account for metrorrhagia. There may be no changes in the mucous membrane, but there may be disturbances in the internal secretion of the ovaries.

DIAGNOSIS OF THE CAUSE OF METRORRHAGIA

In making the diagnosis it is important to utilize the various aids. The sound shows the size of the uterine cavity, the smoothness of the lining, the presence of foreign bodies, or the sensitiveness of the lining.

Pain is associated with abortion, ectopic gestation, with the expulsion of clots, or with an inflammation. Purulent and mucopurulent discharge from the uterus or cervix speaks for an inflammatory condition. We should consider the significance of a previous amenorrhea. We should ascertain the

effect of cohabitation, which in carcinoma often produces an oozing. We must take into consideration the history of previous abortions and labors and should take cognizance of the age of the patient, and more especially the history of *bleeding following a period of amenorrhea* at the climacteric age. The character of the blood is of importance. A fresh gushing hemorrhage speaks for an open vessel, and is found in abortion, malignant degeneration, and with polyps. The presence of pieces of blood or coagula implies a bleeding so rapid that the uterine secretion cannot prevent the clotting. It is observed in fibroids, with carcinoma, with polyps, and with abortion. A dirty, brown-red discharge means long retention in the uterus, and is frequently seen in conditions related to pregnancy. A syrupy, thick discharge suggests hematocolpos.

When irregular bleedings occur in a patient without leukorrhea in whom there is no evident cause for hemorrhage, if the endometrium is normal, if the adnexa are not inflamed, and if there is a history of frequent labors, especially so if the patient is about the menopause age, metritis, fibrosis uteri, or arteriosclerosis are the responsible factors.

Those causes which before the climacterium produce hemorrhage through hyperemia of the mucous membrane (interstitial endometritis, myoma, periuterine inflammation, and circulatory disturbances) are of little moment after the menopause. The bleedings which occur in this post-climacteric stage may be due to ulceration, erosions, colpitis senilis, mucous polyps, submucous myomata, etc., but 65 per cent. of the cases of bleedings in the post-climacteric period are due to carcinoma.

In the early stages of carcinoma the diagnosis can often be made only by microscopic examination. *A test excision or test curettage should be made in every doubtful case,* since the clinical symptoms alone are such as to suggest a probable diagnosis of "chronic metritis," "endometritis," "erosion of the cervix," "ulcers," etc. "Chronic endometritis with long-continued profuse menstruation" is a frequent diagnosis when there is really carcinoma of the fundus, either circumscribed, diffuse, or polypoid in form. Corpus carcinoma is characterized by its slow, localized development, and may be for months confined

to the uterus itself, with very slow or late extension into the adjacent organs and lymphatics.

TREATMENT

The *treatment of carcinoma and sarcoma* of the vagina is surgical in those cases seen sufficiently early to permit the removal of the entire vaginal wall together with the uterus and the adnexa. The operation should be followed immediately by intensive radium or x-ray therapy. In more advanced cases radium or x-ray offer the only hope of cure. As a rule, however, such treatment is palliative only; sooner or later recurrence or metastasis becomes evident.

The treatment of uterine carcinoma varies, according to the ideas of different gynecologists. Some men now rely almost entirely upon radium and x-ray, while others still operate upon all but extremely advanced cases. We believe that cases of carcinoma of the fundus, and early cases of carcinoma of the cervix should be operated upon, and radium or x-ray treatment instituted immediately thereafter. The more advanced cases are probably better off without surgical interference.

The *treatment of chorioepithelioma* is surgical.

Polyps, whether of the cervix or uterus, should be removed. Polyps of the cervix may be removed, under strict aseptic precautions, by the cutting of the pedicle, followed by the application to the stump of carbolic acid or nitric acid or the actual cautery. Polyps of the uterus, if small, should be curetted away. If large and situated near the fundus, or if of broad base, their removal implies a delicate surgical operation, not infrequently combined with a long incision of the anterior wall of the cervix and uterus to permit of direct approach to the polyp.

The *treatment of abortion* is given on page 358.

The *treatment of ectopic gestation* is entirely surgical.

In any of the bleedings associated with the *acute infectious diseases* the vagina should be douched daily with a 1 per cent. alum, or 1:3,500 permanganate solution, and subsequent observation should be directed to the prevention of atresia.

In *senile vaginitis* the mucous membrane is often very thin, extremely red and congested, and often eroded. The slightest

force on examination, or the use of specula, causes bleeding. Senile vaginitis should be treated by regular vaginal bathings with pure pyroligneous acid three times a week, carried out through the Ferguson speculum, combined with daily douches consisting of a tablespoon of pyroligneous acid to each quart of water.

Erosions are sometimes so sensitive and contain so many capillaries that any but the most gentle touch will cause oozing and bleeding. Erosions are best treated by the local application of pure carbolic acid, followed by a thorough painting with tincture of iodin, followed by boroglycerin poured into the vault of the vagina, after which the vagina is packed with gauze. In the later stages solutions of nitrate of silver stimulate the healing process.

The following drugs are used in the treatment of uterine bleedings.

Ergot has the effect of contracting blood-vessels and has an especial value in producing contraction of the uterine muscle. It is decidedly valuable when the uterus is atonic or dilated as a sequence of pregnancy or abortion. It naturally has a much diminished influence when the muscular elements of the uterus are degenerated or replaced by fibrous connective tissue. Ergot contracts the uterine muscle and raises the blood-pressure. It finds its most frequent application in overcoming or preventing post-partum hemorrhage, in aiding the emptying of the uterus in abortion, and in promoting involution of the uterus. It should be used sparingly in the first week after labor, as it has a tendency to diminish or stop the secretory function of the breasts. Ergot requires from fifteen to twenty minutes to produce a result when given by the mouth. *Ergotol* is two and one-half times as strong as the fluidextract of ergot and it works especially well and rapidly when hypodermatically given. Ergotin (Bonjean) in doses of 2 to 5 grains has an excellent effect on the uterine muscle, but acts more slowly and more continuously. It is, therefore, well adapted for long-continued use and in cases not requiring an immediate rapid contraction of the uterus.

Hydrastis acts upon the vascular system as a vaso-constrictor and causes a general rise in blood-pressure. It has also the

power to produce uterine contractions. Hydrastis is of value in all forms of hemorrhage from the uterus, and has, in addition, a stimulating trophic effect on the uterine muscle. The dose of the fluidextract is one-half to one dram several times daily.

Pituitrin has no effect upon uterine bleeding directly, but promotes contraction of the uterine muscle after abortion, and has a stimulating influence in subinvolution. It may be given in doses of 3 to 5 minims intramuscularly.

Stypticin (cotarnin hydrochlorate) arrests hemorrhage by an astringent action or by directly affecting the blood. It is a hemostatic and uterine sedative. It is most efficacious in bleeding not due to incomplete abortion or new-growths. It is of especial value in prolonged or profuse menstruation. It is also a powerful local hemostatic. The dose is 2 to 4 grains four to five times daily. A 10 per cent. watery solution can be readily given by hypodermic syringe.

Styptol (cotarnin phthalate) is a hemostatic and sedative, but is said to cause a rise of blood-pressure. It is highly recommended by Carl Abel as a uterine hemostatic, and especially as a sedative. It is used by him (1) in profuse menstruation in young girls and nulliparæ, (2) in climacteric hemorrhage, (3) in bleeding during pregnancy, (4) in the hemorrhage due to myomata, (5) in the hemorrhage coming from carcinoma, (6) in dysmenorrhea, being then given between the menstrual periods. The drug is best given in the original sugar-coated tablets, containing 0.05 gm., five to eight times daily.

Thymus extract, in doses of v to x grains, is of value in cases of menorrhagia due to hyperactivity of the ovaries. It may frequently be combined with mammary extract to advantage.

Mammary extract has some value in uterine hemorrhage in the dose of v to x grains several times a day. In addition to its action on the blood-vessels, it certainly causes continued uterine contraction.

Placental extract in doses of gr. v t. i. d. has often an excellent affect. It will delay normal menstruation from two to five days in two-thirds of all cases.

Some cases of profuse, continued, irregular bleedings, especially when due to anemias and myomata, are benefited

by the administration of *chlorid of calcium*, 40 grains in solution being given daily to increase the coagulability of the blood. Milk is to be avoided during its use.

Thyroid extract is sometimes of service in menorrhagia and endometritis by diminishing uterine congestion and hyperemia. The dose of iodothyrin is from 5 to 10 grains three times a day.

℞. Stypticin..... gr. ij
Ft. tal. tabell. no. xx.
S.—One every two hours.

℞. Stypticin..... gr. ij
Ergotin..... gr. ij
Ft. tal. caps. no. xx.
S.—One every three hours.

℞. Stypticin..... gr. ij
Ergotin..... gr. ij
Placental extract..... gr. v
Hydrastinine hydrochlor..... gr. ss
Ft. tal. caps. no. xx.
S.—One every four hours.
℞. Ext. mammary desicc..... ʒv
Ext. thymus desicc..... ʒv
Ft. capsulæ no. lx.
S.—One before meals.

In some cases of long-continued hemorrhage, where stimulation of the heart is advisable, *digitalis* is a drug of value. The infusion, especially in the dose of an ounce and a half, is said to cause contraction of the uterus in menorrhagia. It should be used with caution.

In all cases of *masturbation* efforts directed toward the stopping of this habit are of avail only when the patient's attention is called to its risks and dangers. Coitus interruptus and excessive coitus are conditions to which attention must be paid, for these are elements which serve to produce an excessive congestion of the genital tract or a congestion not relieved by the sexual orgasm.

Menorrhagia due to *retroflexion* may be corrected by reposition of the uterus to its normal position. This is best done by the use of a Hodge or Smith pessary or by operation. The use of the pessary must often be preceded by treatment which

gradually elevates the uterus and puts any relaxed ligaments, such as the uterosacral ligaments, on the stretch. Whenever the uterus can subsequently be readily brought by bimanual manipulation into a normal position, with the cervix high up and far back, a suitable pessary may be introduced. It is to be worn only if the patient experiences no pain or discomfort. If the pessary then relieves the annoyances, a Gilliam operation, or any other method which shortens the round ligaments will permanently retain the uterus in a position which prevents that congestion which may have existed as a direct result of the retroflexion. Stypticin, ergotin, and mammary extract should be given during menstruation.

Pyosalpinx, *salpingitis*, *parametritis*, and other inflammatory conditions about the uterus which produce excessive congestion, with or without compression of the blood-vessels, can be medically treated by rest and the avoidance of effort, by the wearing of an elastic abdominal bandage for the purpose of giving intra-abdominal support. Hot douches, for their effect on the pelvic circulation, are of importance. Sitz-baths containing 3 to 4 pounds of sea salt and 3 to 4 ounces of calcium chlorid, taken for a period of fifteen to twenty minutes at body-temperature, a half-hour before retiring, have an important action in stimulating the pelvic circulation and in diminishing edematous and exudative changes. Full Nauheim baths, when they can be taken, have a still better action than the sitz-baths. At night there should be applied to the abdomen a moist flannel bandage covered with oiled silk or with chamois skin and left in place during the night. Three times a week boroglycerin should be introduced into the vagina through a bivalve speculum and the fornices should be then packed with gauze, which is also gently packed into the entire vaginal canal. Stypticin in large doses should be given for the bleeding. Most of these cases, however, eventually come to operation.

Metritis of an inflammatory character demands the same treatment as that suggested for periuterine inflammation. In the early cases sitz-baths or Nauheim baths are sometimes of very great value.

The removal of *retained membranes or placental structures*, or of part of a placenta or of a complete placenta, demands thorough dilatation of the cervix, with or without the splitting of the cervix by the Dührssen method of minor vaginal cesarean section, with a thorough examination of the cavity of the uterus (if sufficiently large) by the examining finger and a removal of all that is possible with the aid of the finger, supplemented by the use of the placental forceps and the curet. In those cases where menorrhagia is due to probable retention of decidua, ergotin and pituitrin should be given for several weeks if curetting is refused or contraindicated.

Endometritis (whether inflammatory or not), which is of the character known as glandular or hyperplastic endometritis, can be treated by intravaginal pressure therapy. Pelvic anemia can be produced by abdominal applications and by sitz-baths. It is particularly in the non-inflammatory cases that ergot, hydrastis, styptol, stypticin, and mammary extract are of very great value. If these fail, curetting can be done. In those cases in which a uterine or periuterine inflammation is present curetting should be done only if the bleedings are so marked as to seriously jeopardize the patient's health. It goes without saying that rest in bed during menstruation is of great importance.

Rest in bed and the avoidance of any exertion, together with the hot-water bag applied to the spine, are essential procedures in the treatment of uterine hemorrhage. Short hot vaginal douches are often of value. In some cases of continued menorrhagia, scarification of the cervix before menstruation may diminish the amount of blood lost subsequently. In many cases a curetting must be done. In those cases associated with hyperplastic endometrium after curettage subsequent applications to the uterine lining are of value. Among the topical applications to the endometrium are liquor ferri sesquichlorati, pure tincture of iodin, 50 per cent. solution of carbolic acid in alcohol, 10 to 20 per cent. chlorid of zinc. Martin uses 1 c.c. of the iron, injecting it drop by drop as the syringe is drawn out. It is well to use a Braun syringe covered with cotton. The uterus is then irrigated and gauze is placed only in the vagina.

Subinvolution, when seen in the early stages, demands the use of hot douches, vaginal treatment by glycerin and gauze, each vaginal treatment being preceded by a thorough painting of the vault of the vagina with tincture of iodin. The uterus should be encouraged to return to its normal size by continued small doses of ergot, ergotol, or ergotin combined with hydrastis, to which preparations stypticin or styptol, should be added during menstruation. Intramuscular injections of 3 or 5 minims of pituitrin every other day are of service in these cases.

Subinvolution after labor or abortion, where the evidences of uterine atony are marked, warrants the use of hot vaginal douches of 1 to 3 quarts, cool sitz-baths of a duration of five to thirty minutes, massage of the uterus, and, best of all, a complete course of Nauheim baths. Malposition should be corrected and there should be abstinence for a long period from sexual intercourse. In stout women the hyperemia and the associated obstipation should be treated with Glauber's salts associated with the application of the sinusoidal current and appropriate diet.

Passive hyperemia of the uterus furnishes the basis on which an inflammatory metritis is easily engrafted. In lymphatic and scrofulous women the uterus often remains large, with a profuse serous or mucoid discharge. For this condition salt baths and Nauheim baths are especially indicated. The following combination is of value:

℞. Physostigmine salicylatis..... gr. 1/60
Ergotin..... gr. iij
Mammary extract..... gr. v
Strychn. sulph..... gr. 1/60
Ft. tal. caps. no. xxx.
S.—One t. i. d. for several weeks.

In *non-inflammatory metritis* or subinvolution fibrosis we are dealing with an end-stage of a previously existing congestion, and with structural alterations which diminish the contractile power and character of the muscle fibers, of the elastic connective-tissue fibers, and of capillaries and vessels of the uterus. Associated with this is also a chronic congestive state in the

ligaments of the uterus and in the pelvic connective tissue and a lack of tone in the general circulatory apparatus. The treatment consists in the administration of the preparations of ergot, hydrastis, stypticin or styptol, and mammary extract. Sitz-baths, 50° to 65°, five to thirty minutes, or the Nauheim baths, should be given.

In some cases, those associated with *arteriosclerosis*, the sitz-baths, or even the Nauheim baths, are contraindicated when they result in increasing the discharge of blood or in bringing it on at an earlier period. In stubborn cases a curetting may be done. Some of the cases associated with marked hypertrophy of the cervix are benefited by a high amputation of the cervix, followed by curetting. Many of these cases require hysterectomy for cure.

Bleeding due to *fibroids* can sometimes be controlled by long continued doses of mammary and thymus extracts. Drugs, such as stypticin, calcium chlorid, etc., curettage, x-ray, and radium are also of value in many cases. When these various procedures fail, myomectomy or hysterectomy offer relief. X-ray or radium therapy is an ideal method of treatment for uterine fibroids in patients in whom operative measures are contraindicated by cardiac lesions, nephritis, or metabolic disturbances. They are also of service in cases of fibroids of moderate size, when sterilization of the patient is of no consequence. Bleeding stops promptly and the tumor usually diminishes in size. Large tumors, fibroids in young women, and those causing pressure symptoms, however, should be operated upon.

A *rapid loss of blood* is best treated by tamponing the vagina, and in some cases the uterus, with iodoform gauze. Hot vaginal douches or even irrigations of the uterus may be used with water at 110° to 120° F. before packing.

If the cause of menorrhagia is associated with impotence in the male or with coitus interruptus, or is produced by use of the sewing-machine or by bicycle or horseback-riding, these should be avoided. If there is passive hyperemia, obesity, or constipation, salt baths are of value after a course of Glauber's salts. Short sitz-baths, 70° to 85°, five to fifteen minutes, are also of aid.

In *chronic atony of the uterus*, found in debilitated women, after prolonged lactation, as well as in the form resulting from many labors in rapid succession, short hot vaginal douches, massage of the uterus, ergotin, and pituitrin are useful. Curettage is contraindicated.

If there is an atonic, soft, thin-walled uterus, we use ergot, bimanual massage, Nauheim baths, etc.

Climacteric bleedings are best treated by mammary and thymus extracts, or if these fail, by radium or x-ray.

Many of the climacteric bleedings are due to atony or arteriosclerosis. Rest and tamponing of the vagina or the uterus are of value. Hot vaginal douches of 2 quarts of water are beneficial. Hot applications to the sacrum or a hot sand-bag to the lower vertebræ, and prolonged cool sitz-baths, are useful. Weil and others have proved the *injection of blood serum* to be of use in hemophilia. In case of intravenous injection, the amount injected daily should be from 10 to 20 cubic centimeters (2½ to 5 fluidrams); in subcutaneous injections the amount should be from 10 to 30 cubic centimeters (2½ to 7½ fluidrams). If the injections are repeated in two or three days the desired effect may be secured, whether it be the checking of an existing hemorrhage or the prevention of undue bleeding in the course of the operation, and the benefit may be expected to last for a month or more. If fresh serum is unavailable, an efficient substitute is to be found in the ordinary antidiphtheritic serum. Transfusion is a more satisfactory method of controlling these cases.

Treatment of Abortion.—The treatment of inevitable abortion consists in reproducing the steps involved in normal labor. In labor dilatation of the cervix is aided by uterine contractions forcing the "bag of waters" into the cervix, and by the upward pull of the cervical fibers around the presenting part of the child, as if drawn around a pulley. Continued uterine pains expel the contents, and further contractions of the uterus in the third stage loosen the placenta and expel it. Therefore the treatment of abortion consists in aiding dilatation of the cervix, in aiding the separation of the ovum and placenta, and in aiding the expulsion of the contents. At the same time the interests

of the patient should be conserved by limiting the hemorrhage as much as possible. The very means which are best adapted to preventing an excessive loss of blood happen to be the very means which are of the greatest value in dilating the cervix. If an abortion is inevitable, and if it is desired to carry out the procedure in the simplest manner, the following should be done with strictest surgical aseptic precautions.

The vulva, the vagina, and the cervix should be thoroughly prepared. With the aid of a bivalve speculum or with the aid of Sims' specula the cervix should be grasped by volsellum forceps, and a long strip of iodoform gauze, its width depending on the dilatation of the cervix, should be introduced into the cervix and as much passed up into the uterus as possible. The cervix should then be packed thoroughly. The vagina, from the fornices to the introitus, should be packed with a very wide strip of iodoform gauze arranged in plaited form, thus furnishing a packing which completely and solidly fills the vaginal canal. With the aid of a T-bandage and gauze about the vulva the vaginal packing should be kept in place. Ergot, 1 dram, or pituitrin, 3 to 5 minims, should be administered every two or three hours. The vaginal packing prevents the exit of blood from the uterus and hemorrhage is restricted to a minimum. Through the gauze within the cervix dilatation of the cervix is produced. As a result of the packing in the vagina and the cervix the blood thus poured out in the uterus is retained within it. Contraction of the uterus compresses this blood, the poured-out blood dilates the uterus and cervix, accumulates between the ovum and the uterine wall, and is an important factor in peeling the ovum away from its contact with the uterine wall. Contraction of the uterus and the effort of the uterus to expel this accumulation of blood dilate the cervix.

If this packing is removed at the end of twenty-four hours, the cervix will be found considerably dilated. The same steps as mentioned above should be repeated, but a wider piece of gauze should be packed into the uterus, and especially into the cervix. The vagina is then thoroughly packed and the use of the ergot is continued. It rarely takes more than forty-eight hours with this method to dilate the cervix so that it readily

admits the middle finger. At the same time the ovum and the chorionic villi or placenta are often completely loosened from the uterine wall. The cessation of uterine pains can generally be taken as proof of separation of the ovum. At the end of the forty-eight hours, then, the gauze is removed, and not infrequently the ovum is so situated that placental forceps introduced into the cervix can grasp and remove it—sometimes the fetal sac with the embryo, at other times the fetal sac and then the embryo. If the placental forceps do not grasp a loosened ovum, anesthesia is generally necessary, and the middle finger, under the strictest aseptic precautions, is introduced into the cervix and uterus; the other hand, pressing through the abdominal wall, pushes the uterus down into the pelvis and presses on the fundus (Fig. 86). In this way the middle finger of the internal hand can palpate the entire uterine cavity, can separate the whole ovum or the adherent parts, or remove whatever of fetal sac or placenta is attached. After this procedure the placental forceps carefully introduced can extract whatever loosened contents are in the uterus. The uterus should then receive a very hot douche, with a double-running irrigator, of 1 per cent. lysol. If the finger has been unable to separate any of the placental tissues, their location at least is noted, and placental forceps or a large blunt curet is then introduced for their removal. The uterus is then packed with iodoform gauze and pituitrin is administered. The vagina is also packed with iodoform gauze, which is removed in from twenty-four to forty-eight hours. In incomplete abortion it is rarely necessary to use the sharp curet unless, in very early cases, the uterus is so small that the finger method cannot be used. The use of the sharp curet is a dangerous thing: first, we are never sure that we have removed all the products of conception; second, perforation of the uterus occurs very readily. During the manipulation of the curet the uterus dilates and contracts easily, as it does in the post-partum period at full term, and if the curet is held very firmly, simple contraction of the uterus is enough to cause perforation by this sharp instrument.

It is by no means unusual to find, in abortions at the tenth or twelfth week, that an embryo is spontaneously expelled, but

decidua, the sac of the ovum, or placental remnants are retained. These, as a rule, prevent the uterus from returning to normal size, the cervix does not contract, and there is generally either continuous or irregular loss of blood. Under these circumstances the same method of dilatation of the cervix by iodoform gauze, and of examination and cleansing of cavity with the finger, is advisable. If this procedure is not possible, the dull curet should be used with the greatest caution. In using the curet in the uterus, it is customary first to measure the length of the uterine cavity with a sound, and then to place the index-finger of the right hand on the curet at a point which makes the distance from the tip of the curet to the finger a little less than the length of the uterine canal, as measured by the sound. Curettage is then done, with the finger held firmly on this point, so that the instrument at no time enters further into the uterus than the measured length. The above described method of painless, slow dilatation of the cervix by the use of the iodoform gauze is a simple procedure. The above method of removing the contents of the uterus by the introduced finger is wisest and safest. The finger recognizes adherent tissues. It locates any tissue that cannot be scraped off. It cannot perforate the uterus. It makes the diagnosis and carries out the treatment. It should be used in every case in which the uterus is three times the normal size.

The diagnosis is more difficult when the cervix is closed. The continuation of pain speaks for the retention of the ovum or of large masses, and bleeding continues. The uterus may be enlarged through the thickness of its own walls rather than through the size of the contents. The sound may show irregularities or roughness in the very early months, but its use causes bleeding. Winter says that the larger and softer the uterus, the more does it speak for the retention of fetal and decidual products.

The death and retention of the ovum and embryo in the first half of pregnancy results in a diminution of the succulence and blueness of the vagina and cervix. The uterus becomes harder. Bleeding is less frequent than in abortion. The important aid in diagnosis is observation of the fact that the uterus does not

increase in size in the course of several weeks, or that the uterus is much smaller than the length of the amenorrhea warrants. The chorionic villi may grow after the death of the embryo. Such an ovum is found to be covered by thickened decidua. Decidua serotina especially is thickened and infiltrated with blood. There is little amniotic fluid and the embryo may be present or degenerated. Such an ovum has been called bloody mole if fresh blood is present, and fleshy mole if decolorized old blood is present.

In some cases the entire placenta may be retained within the uterus. Bimanual examination shows a large uterus, dilated cervix, and the diagnosis generally made is submucous fibroid or chorioepithelioma. In fact, with very adherent placenta, examination by the finger does not always make the differentiation. Such a placenta may be retained in the uterus a year or more, and if it undergoes no putrefactive changes the diagnosis is indeed difficult. More frequent is the retention of decidua which does not undergo involution, but remains as a hypertrophied, hyperplastic lining, giving rise to menorrhagia and repeated abortions.

Most frequent is retention of microscopic fetal cells in the form of villi, or the cells which cover the villi, the cells of Langhans, and the syncytium. The most frequent causes of repeated abortion are syphilis, retroflexion (metritis and fibrosis uteri), and especially "endometritis hyperplastica."

Abortion is most frequent in the third month, when the chorionic villi begin to atrophy except at the serotina, the future placental site. The danger periods in repeated abortions are the omitted menstrual days—the periods when menstruation would have occurred had no pregnancy taken place.

We have found that mammary extract gr. v–x t. i. d. has the most wholesome effect in restoring to the normal size and consistency uteri subjected to interruptions of pregnancy. Its routine use, post-partum, in patients who do not or cannot nurse the baby is strongly advised.

LEUKORRHEA

The term "leukorrhea" implies a discharge of white, yellow, or green, thin, thick, or mucoid secretion originating from the vulva, vagina, cervix, or uterus. This secretion may represent either a hypersecretion or an inflammatory product. A purulent secretion from a urethritis may be accumulated within the folds of the vulva, and may cause, in addition to its own accumulation, a chronic localized inflammation of the inner surface of the labia, of the vestibule, and about the introitus. A purulent involvement of one or both of the glands of Bartholin may cause a more or less constant discharge of pus, to which may be added the secretion resulting from an associated vulvitis. Such a secretion is to be noted in chronic and acute gonorrheal involvement of the vulva and of the ducts and canals which open into the vulva. This condition is most clearly exemplified in the gonorrheal vulvitis of children, with which a vaginitis is almost invariably combined. In the chronic forms of vulvitis not due to the gonococcus there is a reddening of the vulva and the secretion may be of a rather serous nature.

Normal Vaginal Secretion.—The vagina of the newly born is sterile only for two or three hours, after which period bacteria are present. The normal vaginal secretion contains cast-off squamous epithelia and myriads of bacilli and other non-characteristic micro-organisms. The bacilli present in the normal vaginal secretion are short rods, evident to any one who examines a specimen under the microscope. These important bacilli are those described by Döderlein, and are held responsible for the acid reaction of the normal vaginal secretion. This acid reaction is credited with a restraining influence on the growth of other bacteria and renders the normal vagina free of pathologic germs, destroying within twenty-four to forty-eight hours any pathologic cocci or bacilli introduced experimentally into the vagina. The normal vaginal secretion, then, contains desquamated squamous epithelial

cells, the bacilli of Döderlein, and many other micro-organisms, and is of a serous, milky character.

Hypersecretion.—A milky serous secretion is characteristic of the vagina. As the normal vaginal secretion contains squamous epithelia alone, it is wrong to consider any vaginal secretion of this nature, even though profuse, as inflammatory. Such a condition is often the result of hypersecretion and is noted with pelvic tumors, uterine adenoids, and with other conditions which cause pelvic congestion. Hence it is particularly marked in pregnancy and in the first few weeks after labor. Hypersecretion may be due also to chlorosis, to anemia, to onanie, and to excessive intercourse. Hypersecretion represents an increase of the normal secretion which is of a milky, serous character. There is often a great accumulation on the surface of the vagina of drier, white particles consisting of cast-off squamous epithelium. Smears of such discharges show a marked increase in mucus threads and mucus corpuscles, few pus cells, and no pathogenic micro-organisms other than a few micrococci catarrhalis.

Bacteria in the Vagina.—There has been and is much difference of opinion as to the presence of pathologic bacteria in the vagina, some finding streptococci, staphylococci, in a certain proportion of cases with pathologic secretion, while others deny such findings. It must be remembered that the vulva harbors numerous bacteria and cocci of various forms. Menstruation, masturbation, lack of cleanliness, too frequent douching, intercourse, etc., are causes which favor the entrance of these vulvar germs into the vagina. We know that bacteria may be introduced into the vagina by the manipulation of examination. Their growth may be favored by the wearing of pessaries for long periods or by the retention of tampons for too long a time, thus really producing a mild vaginitis. The bacterium coli from the rectum, especially in women with lacerated perineum, and more so in women with tissues of lessened resistance, may find ready entrance into the vagina. The pernicious habit that some women have of using toilet paper from behind forward is often the means of transmitting colon bacilli to the genital organs. Latent gonorrhea in the male is productive of

infection of the vagina, cervix, and uterus, not always with the gonococcus, but with the other cocci often present in such chronic prostatic conditions in the male. The blood expelled in menstruation, after abortion, or after labor diminishes the acidity of the vagina and furnishes a medium which furthers the development of any bacteria or cocci which are present and becomes a factor which favors their upward extension. Therefore it must be said that very often the bacterium coli and numerous bacilli and cocci of saprophytic type, together with yeasts, are found with pathologic conditions in the vagina, cervix, and uterus. In addition, there may be found gonococci, and also streptococci and staphylococci. The virulence of the latter forms differs widely.

Leukorrhea Due to Colpitis.—In addition to squamous epithelia, polynuclear leukocytes or pus cells may be present. In some women bacteria and saprophytes of various forms grow in the vagina and produce a mild vaginitis with marked desquamation of squamous epithelia, especially in warm weather. In such cases we note the presence of numerous forms of bacteria. They may be found in such variety and large numbers that they give the picture of a pure culture. The vagina on close examination may show a diffuse reddening or it may be covered with multiple small red granular spots. Other cases show isolated areas of dark red or blue character with a dilatation of fine venous channels. Associated irritation of the external genitalia is sometimes evident to the eye, and is due either to this vaginal factor or to scratching, which causes an added irritative condition. It is necessary to note the cause, and to differentiate the local vulvar changes due to the causal factor from the external changes brought about by scratching or irritating treatment. In many cases no external or internal lesions are evident, the only symptom being a profuse vaginal discharge. Often changes probably have been present, and having run their course, only the discharge remains. The Ferguson speculum should be used for inspecting the character of the vaginal mucosa.

In gonorrheal vaginitis there is a discharge of purulent secretion containing pus cells and gonococci. Primary gonorrheal vaginitis in adults is not frequent, but in children always

accompanies a gonorrheal vulvitis. The vaginitis of gonorrheal origin is generally secondary in this sense, namely, that it is caused by the discharge of gonococcus-bearing secretion from the cervix and uterus, which, by constantly bathing the vaginal mucosa, finally causes a vaginitis which is most marked in the posterior fornix and on the posterior wall of the vagina. The vagina may be diffusely red and granular and may show loss of epithelium in certain areas, especially in the posterior fornix. Gonorrheal vaginitis becomes more intense in pregnant women.

The discharge in every case of leukorrhea should be examined microscopically to determine the identity of bacteria present. In examining vaginal secretions we may find, besides the bacilli of Döderlein, other bacteria. In addition, leukocytes or pus cells may be present. The greater the number of leukocytes, the greater is the inflammatory reaction.

A milky serous discharge is present with mild colpitis. A green or yellowish-green discharge coming from the vaginal wall is probably gonorrheal. Colpitis is to be diagnosed by the character of the vaginal secretion and by changes in the mucosa. If pus cells are found in the vaginal secretion, admixture of the pus from the cervix or uterus must be excluded by use of the Schultze tampon. Pus cells in the vaginal secretion mean inflammation.

Hypersecretion from the Cervix.—In many women, especially unmarried, there is a profuse hypersecretion of clear tenacious mucus from the cervix. This may result from congestion, from masturbation, or from displacement of the uterus. It is not an abnormal secretion in character. The microscope shows mucus and a few cast-off epithelial cells. A pathologic secretion is white, yellow, or green, and consists of mucus, epithelia, and polynuclear leukocytes or pus cells.

Leukorrhea from Erosions.—Erosions represent a substitution of the squamous epithelium of the vaginal portion of the cervix, situated about the external os, by cylindrical epithelium of the cervical canal. Erosions are almost invariably due to an associated cervico-uterine catarrh. The erosion itself produces a catarrhal yellow secretion, especially if of the glandular type. Since the erosions are due to cervical or uterine discharge (often

gonorrheal), the amount of mucoid secretion discharged from the cervix may be very marked.

Leukorrhea from Endocervicitis.—In the more acute forms of endocervicitis due to gonorrhea the discharge is of a greenish and later of a yellowish character. It consists largely of pus cells. A typical cervical discharge is always mucoid, but there are cases of gonorrheal involvement of the cervix and uterus in which the cervix does not react by the production of much mucus and yet the lining of the cervix is inflamed and reddened. In such cases it is hard to distinguish between the discharge which comes from the cervix and that which comes from the uterus. Acute endocervicitis may be followed by some hypertrophy of the cervix, and later on by erosions. In the most frequently observed form of cervical inflammation we have what is known as a chronic endocervicitis, characterized by a discharge of whitish, thick mucus and by hypertrophy. There may be present on the vaginal portion of the cervix the so-called follicles of Naboth, which represent either a dilatation of cervical glands which have grown through the cervix up to the squamous epithelium, or else they represent dilatation of the glands present in an erosion. This condition of chronic cervical catarrh is very frequently associated with an involvement of lymphatic connective tissue situated in the posterior parametrium and in the uterosacral ligaments. This involvement of the post-parametrium is most marked in those cases originally gonorrheal or originally septic after abortion or labor. In this chronic and very frequent form there is often an eversion of the lips of the cervix when they are torn laterally. The everted mucous membrane may be red and swollen and produces much discharge. In chronic endocervicitis we have a catarrh of the cervix due to chronic inflammation and irritation by bacteria of various forms, producing a white or yellow stringy mucoid secretion, often very thick and tenacious, and often forming a plug which may completely fill the dilated cervical canal. A mucoid discharge comes from the cervix and not from the uterine cavity.

Leukorrhea Coming from the Uterus.—Even in puerperal women free of fever a certain small percentage show streptococci,

staphylococci, gonococci, and bacteria in the lochia. The relative proportion of the infecting bacteria in puerperal endometritis, according to Krönig, shows 2 per cent. staphylococci, 27 per cent. saprophytes, 27 per cent. gonococci, and 43 per cent. streptococci. The fatal cases are usually due to streptococci.

It is claimed by some that bacteria are present in chronic hyperplastic endometritis, but Döderlein says that this is not so. Peraire found bacteria in all cases of endometritis and metritis, among them a bacillus and a coccus which, in pure culture, caused inflammation in the vagina of rabbits and the uteri of dogs. Döderlein says that this is no proof that they would do so in the human being. Brandt in twenty-five cases of endometritis obtained the curetted particles and developed cultures from twenty-two. In one-third of these he got streptococci and staphylococci pyogenes aureus and albus. These Döderlein calls an accidental infection of the media. Pfannenstiel and Menge obtained negative results by tests like Brandt's. Bumm in fifteen cases of endometritis found bacteria by cultures. He says that they are not the cause but are only added factors. Menge in seventy-three uteri examined the fundus in seventy-three and the cervix in twenty-nine, and found only six cases with bacteria. Among these were cervix carcinoma, a submucous myoma, and a case of tuberculosis. The corpus mucosa in seventeen was normal, in twenty-nine was hyperplastic or hypertrophic, in twenty-one inflammatory, that is, there was small-celled infiltration. Examination of the cervix mucosa showed ten normal, ten hyperplastic or hypertrophic, and nine inflamed.

We must distinguish two forms of "endometritis"—a non-inflammatory and an inflammatory. The non-inflammatory represents simply a hyperplasia of the endometrium, *i.e.*, an overgrowth. It is characterized by menorrhagia and profuse discharge is not a symptom. In the inflammatory form there is round-celled inflammatory involvement of the endometrium, sometimes diffuse, more often localized or scattered, sometimes deep, but more often superficial. It is characterized not by menorrhagia but by discharge and by pain.

Uterine leukorrhea means, then, a discharge from the uterine canal of a serous, sero-purulent, or purulent secretion containing epithelia and polynuclear leukocytes or pus cells. It is divided into the forms known as gonorrheal and catarrhal. The gonorrheal form implies the finding of gonococci, yet in many cases where the yellow or green discharge contains nothing but pus cells, the gonococci cannot be found. A discharge containing epithelia and pus cells, and light or white in color, may represent the end-stage of a gonorrheal invasion, or may be due from the beginning to other bacteria.

A white discharge from the uterus, containing epithelia and leukocytes and no gonococci, is known as catarrhal endometritis.

Not every inflammatory condition of the endometrium is characterized by profuse discharge. The secretion cast off from the uterine lining may be slight in amount or even absent, in spite of well-marked inflammatory changes. A Schultze tampon must be left in place for twenty-four hours, and by its use the uterine discharge is collected, is differentiated from the cervical mucoid discharge, and contamination by vaginal secretion and bacteria is avoided. Fig. 12 and Fig. 13 show the apparatus by which the secretion of the cervix and uterus may be obtained for examination.

In older women there is noted a sero-purulent discharge due to growth of bacterium coli or of saprophytes, which is often associated with the vaginal involvement known as senile vaginitis. Senile vaginitis implies the growth on non-resistant tissues of bacilli or cocci which are normally held in check by resistant epithelium and by the normal acid vaginal secretion. The discharge in senile endometritis may be associated with a disagreeable odor. Carcinoma should always be suspected.

A degenerating fibroid may result in the discharge from a uterus of a disagreeable secretion with foul odor. Beginning carcinoma is characterized by a serosanguineous discharge. Tuberculosis of the endometrium (a rare condition) may produce a purulent secretion. Degenerating carcinoma of the vagina, of the cervix, or of the uterus produces a discharge of typically foul odor. Waiting for such a diagnostic sign means almost invariably an inoperable malignant infiltration and degenera-

tion. *Any discharge from the vagina, cervix, or uterus, whatever its color, quantity, or character, in women about forty or after forty, especially if of a foul nature, and more especially if it comes on after a period of climacteric amenorrhea, should be viewed as due to a malignant growth until most thorough investigation proves it to be due to another cause.*

In uterine tuberculosis, infection may have extended upward as a result of genital tuberculosis in the male, as is proved by cases of exclusive involvement of the cervix. Involvement, however, is most frequently found in the cornua, an evidence of the downward extension of a tubal tuberculosis. When the cervix is primarily attacked the condition usually remains localized. There are various gradations; large miliary deposits, caseation, necrosis, and extensive destruction. There is a particular form found in which the uterus is thickened and enlarged and fibroid in character.

In the cervix we have (*a*) the ulcerating form; (*b*) the miliary form; (*c*) the papillary form.

In tuberculosis of the uterus the uterine surface may show tubercles; coalesced tubercles; lining thick and pulpy; lining uniformly nodular and tuberculated; irregular, necrotic, and shreddy endometrium; a necrosis involving the muscularis; a degeneration of the body wall; endometrial ulcers; a tuberculous pyometra; localized polypoid growths.

The symptoms are menorrhagia and mucopurulent discharge. The diagnosis is made by the curette, microscopical examination of excised sections of tissue, and by the existence of other tubercular lesions. Even after hysterectomy, the diagnosis is often made only by the microscope, and the condition is not infrequently mistaken for carcinoma.

TREATMENT OF LEUKORRHEA

When first seen, every case evidencing *vulvitis* should have the vulva thoroughly washed with glycerin-soap and water, making use of cotton sponges. Treatment of the vulvitis demands absolute cleanliness and the correction of the cause. If it is secondary to conditions existing in the urethra, bladder, vagina, cervix, or uterus, these affections must be treated. In addi-

tion to the preliminary washing, the vulvitis itself is benefited markedly by warm sitz-baths taken twice daily for a period of fifteen minutes. Shaving of the parts, if the skin area is involved, is of great value. Twice daily a douche should be taken consisting of 1 dram of acetate of aluminum to 2 quarts of water.

Vulvitis associated with acute gonorrhea should be treated by cleansing of the external structures. Mild solutions of various antiseptics are of value; iodin, 1 per cent.; mercurochrome —220, 1 per cent.; etc. The parts should be carefully separated and gently sponged with cotton soaked in one of these solutions. Bichlorid gauze should then be placed in such a manner that the two sides of the vulva are kept well apart, and a T-binder applied. The vulva must be washed in this manner several times daily. The patient should be kept in bed, the emunctories kept active, and urotropin and salol, 5 grains of each, should be administered four times a day. If the surface is sensitive and red and is irritated by the action of the antiseptic solution, the gauze dressing can be saturated with a ½ per cent. solution of acetate of aluminum. In the subacute stage the vulva should be painted with argyrol 25 per cent., or with nitrate of silver 5 to 10 per cent., and the surfaces should be kept dry and dusted with aristol.

In *gonorrheal vaginitis* the vagina, if not too sensitive, may be treated with the aid of a Ferguson speculum. After sponging with wipes soaked in iodin solution, mercurochrome 220, or some other antiseptic, gauze soaked in 1 to 5 per cent. protargol should be introduced into the vagina, especially into the posterior fornix, and left in place for several hours. Still later the vagina should be bathed, with the aid of a Ferguson speculum, by solutions of nitrate of silver 1 per cent., and the vagina should be gently packed with sterile gauze or iodoform gauze left in place for twenty-four hours. Then irrigate daily with alum 2 per cent., or permanganate of potash 1:5000. In the chronic forms of gonorrheal vaginitis nitrate of silver should be applied in stronger solutions through a Ferguson speculum. In the acute stages of vaginitis douches should be cool, in the subacute stages tepid, and in the chronic stages warm.

In very chronic cases if silver 1 per cent. or stronger fails, paint the vagina every two or three days with tincture of iodin or silver 5 to 10 per cent., and pack the vagina with iodoform gauze. Continue the treatment until vaginal epithelium desquamates. Douches should then consist of tannic acid, sulphate of zinc, or alum, 1 dram to the quart. Splendid results are obtained by bathing the vagina with the aid of the Ferguson speculum with bichlorid of mercury 1:100, rendered acid by a few drops of hydrochloric acid. Then pack with iodoform gauze and repeat twice a week. In the meantime irrigate with 1:5000 to 1:2000 bichlorid.

In that chronic form known as *colpitis granulosa*, first clean the vagina with the aid of the Ferguson speculum, and then use pure pyroligneous acid, rubbing it well into the vaginal mucosa with cotton on a swab. This should be done two or three times a week.

Senile Vaginitis.—Bathe the vaginal walls thoroughly with pyroligneous acid three times a week for several weeks through the Ferguson speculum. Daily douches of pyroligneous acid 3 to 5 drams to the quart are to be given. No pessary is to be worn.

For colpitis mycotica 1 per cent. corrosive sublimate or 3 per cent. carbolic should be applied with the aid of the Ferguson speculum.

Leukorrhea of Virgins.—In the treatment of vaginal hypersecretion in young virgins cure of the chlorosis or other constitutional disturbance usually stops the fluor. If correction of these conditions does not cure the fluor, cool sitz-baths increase the tone of the capillaries. *Arsenic and iron are of value.* The catarrhal conditions occurring with chlorosis, anemia, and run-down conditions are due to anemia and to transudation prompted by the hydremic state of the blood. If venous stasis is present in the pelvic organs, a vaginitis may occur, and often does so in obese girls. For the relief of this condition saline waters internally should be used to act on the intestines, and Nauheim baths should be given.

DOUCHES IN VAGINITIS

℞. Acidi tannici..... ℥iss
Zinci sulph..... ℥iss
S.—℥ij to quart.

℞. Acidi pyrolign..... ℥iv
Two tablespoons in quart of water.

℞. Pulv. aluminii acetatis..... ℥ i j
℥j to quart.

℞. Acidi borici..... ℥j
Pulv. alum..... ℥j
Zinci sulph..... ℥j
℥ij to quart.

℞. Tinct. iodi
Glycerini..... aa ℥iss
℥i to quart.

Many cases of *chronic vaginitis* show almost no local changes, aside from hyperemia, but are characterized by a more or less profuse leukorrhea. The following is an efficient method of treatment for the average case. A Ferguson speculum should be used, since it affords a distinct view throughout the length of the vaginal canal. The vagina is washed thoroughly with cotton sponges soaked in a 1 per cent. solution of lysol. Then there is poured into the speculum pure pyroligneous acid or a 1 per cent. solution of bichlorid of mercury rendered acid by the addition of a few drops of hydrochloric acid. By moving the speculum forward slowly the entire vaginal canal is bathed for one minute, and then dried with cotton. This is followed by blowing in a dusting powder through the speculum, or by introducing a long tubular tampon dusted with aristol or with tannoform and talc equal parts, or with alum and boracic acid in the proportions of 1 of alum to 1 of boracic acid down to 1 of alum to 4 of boracic acid, the tampon being left in place for twenty-four hours. Alum has a mild astringent action.

When a decided astringent effect is desired and glycerin is used; ichthyol-glycerin (5 per cent.) or tannic acid and glycerin (2 to 5 per cent.) are useful. After twenty-four hours, one or two daily douches should be taken. Boracic acid, 2 drams to the quart, serves as a mild cleansing douche, while acetate of alumi-

num, 1 to 2 drams to the quart, is soothing and healing. In the douches, tannic acid, 2 drams to the quart, is an astringent of value, with excessive secretion. Alum, 1 or 2 drams to the quart, also has an astringent action. Bichlorid 1:5000 to 1:1000, creolin, lysol, etc., are cleansing antiseptics. Pyroligneous acid, one tablespoon to the quart, is useful, but the odor is rather unpleasant.

Another method of treatment is a thorough washing of the vagina through a Ferguson speculum with any mild antiseptic solution carried on cotton in a sponge-holder. The vagina is dried and the entire canal is then given a Ferguson bath with pyroligneous acid or with tincture of iodin, or with a 1 per cent. silver solution, care being taken not to let any of the fluid flow out over any of the external structures. The vagina is again dried and an ounce of boroglycerin is poured in through the speculum and the vagina is packed with gauze. The glycerin exerts its action on the cervical lining, and in the course of time clears it of its mucus.

The various preparations mentioned above are to be used as douches. The gauze tampon or the gauze packing is always removed by the patient after twenty-four hours.

This treatment should be repeated two or three times a week, care being taken to avoid irritation of the mucosa, especially when using corrosive sublimate.

The cure of *cervical erosions* and *cervical catarrh*, not infrequently takes several months. It is not sufficient to make local applications to the eroded external surface of the cervix. The associated cervical catarrh must also be treated and cured. The best form of treatment is the application of pure carbolic acid by cotton applicator to the entire erosion area. The application is allowed to remain for only a few seconds if the erosions are superficial, but if the erosion is papillary or glandular, the carbolic acid must be allowed to act longer, as this destroys the cuboidal epithelium which is growing in the area normally covered by squamous epithelium. Pure tincture of iodin is then applied to the entire cervical mucosa and to the vault of the vagina. The alcohol in the iodin tincture inhibits the further action of the carbolic acid and the iodin is applied for its

alterative and antiseptic properties. An ounce or more of boroglycerin is then poured into the vagina and the vagina is packed with gauze, paying particular attention to the fornices. The gauze is removed at the end of twenty-four hours and vaginal douches are given twice daily consisting of 3 to 4 tablespoons of pyroligneous acid in 2 quarts of water, or any of the above-mentioned powders. The applications of iodin to the cervix are made three times a week, the carbolic acid being applied once or twice a week, according to the extent to which the ciliated epithelium has been destroyed. Unless the ciliated epithelium is entirely destroyed (and not too deeply at any one time, in order to avoid much loss of tissue) the erosion will not heal. When healing takes place, the squamous epithelium is seen to gradually grow in from the edges. In the later stages its growth may be stimulated by the local application of nitrate of silver from 1 per cent. up to 5 per cent. This may be done once or twice a week. The purpose of the boroglycerin treatment is to draw out the cervical mucus and to deplete the cervical inflammation from the very depths of the glandular recesses. When the canal becomes clearer and the mucus becomes colorless, the lining of the cervix may be gently painted with tincture of iodin or with 1 per cent. nitrate of silver. The intracervical application of the negative pole of the galvanic current, using 10 milliamperes for ten minutes, three times a week, is of great value in these cases. It aids materially in freeing the glandular crypts of secretion.

In the treatment of stubborn erosions 50 per cent. solution of chlorid of zinc may prove of service. In other cases the erosion must be painted with pure pyroligneous acid or with pure formalin, followed by the boroglycerin treatment. Dickinson has made the observation that carbolic acid or iodin do not act well in certain cases with a tendency to eczema, the use of these applications to the cervix having the effect of bringing out eczematous evidences in the skin. Here pyroligneous acid should be substituted. By some the cervical canal in stubborn cases is gently cleared of its mucus and is painted with 10 per cent. silver or with 10 per cent. solution of chlorid of zinc. In our experience the avoiding of intracervical treat-

ment is followed by satisfactory healing, and no induration, inflammation, or stricture of the canal takes place.

If follicles are present, they should be opened, the mucus squeezed out, and the little recesses should then be touched with carbolic acid followed by tincture of iodin.

A distinction must be always made between *erosions and ectropion*, for ectropion does not yield to this treatment. Ectropion simply represents the everted mucous membrane of the cervix, when deep lateral tears are present. Hence ectropion is found only in women who have borne children, while erosions are present in nulliparæ or multiparæ, most frequently in the former. In cases with marked ectropion or in erosions of the cervix associated with diffuse hypertrophy, especially where the cervix is filled with dilated follicles, repair of the laceration or high amputation of the cervix gives an immediate and satisfactory result.

The treatment of *acute gonorrheal endometritis* necessitates rest in bed until temperature is normal for several days. The bowels should be kept open. The diet should be fluid and ice-bags should be applied to the abdomen. For the pain an opium suppository can be used. Hot vaginal douches of tincture of iodin, ℥i to 2 quarts of water, or mercurochrome 220, 1 per cent. should be given three times daily. Dry bichlorid gauze should be applied to the vulva and the parts kept separated.

In treating *cervical gonorrhea* Bumm makes incisions in the external os, if it is narrow. When the incisions are healed, he clears the cervix of mucus and applies 1 to 5 per cent. silver nitrate at one sitting, until the whole lining becomes white. Ichthyol 5 to 10 per cent. is then applied on cotton or gauze. When the resulting membrane finally comes away, he repeats the cauterization with silver or with chlorid of zinc, and oft-times the patient gets well. If healing does not follow, or if there are signs of endometritis, he treats the uterus carefully, unless the adnexa have been recently affected. In the latter event, he does not treat even the cervix, for care should be exercised to avoid extension to the tubes.

He begins intrauterine therapy, even with women who have had children, with dilatation of the internal os by laminaria,

in order to get good drainage. (Dilatation by means of negative galvanism and intrauterine electrodes is a better method.) Then he swabs out the secretion and applies 1 per cent. silver or 1 to 3 per cent. ichthyol with Playfair sounds covered with cotton. He makes the applications for ten minutes. Injections with a syringe are not advisable. He also uses daily irrigations with a double-running catheter for fifteen minutes to wash out all the folds of the endometrium. He uses silver 1:1000 or ichthyol 1:100. Sometimes the cocci disappear very soon, but sometimes they reappear after treatment is stopped, in which event treatment must be continued for weeks.

When there is a chronic uterine gonorrhea with many squamous epithelia in the secretion and cocci in groups on the epithelia, stronger solutions must be used, such as tincture of iodin, silver 10 to 20 per cent., or strong chlorid of zinc. The resulting strong reactions after such a thorough cauterization, which should be done only once a week, throw off the cocci. If fever occurs on the day of treatment, or if there is increased sensitiveness of the uterus, treatment should be stopped for a while (Bumm).

In *chronic inflammatory endometritis* intrauterine treatment is capable of very great harm. Bumm's method is not recommended.

A *catarrhal endometritis* not associated with hemorrhage should not be curetted. The treatment is the same as that of cervical catarrh. An important aid is the use of glycerin in the vagina, best applied with gauze. A very good procedure consists of douches of several quarts of cold water, beginning first with tepid water and gradually cooling it down in the course of weeks. When continued for weeks, it has a beneficial effect. This treatment is far safer than dilatation of the cervix with Hegar dilators or with Weir's sounds, and irrigation with 1 per cent. lysol, 1 to 2 per cent. carbolic, 1: 3000 sublimate, or ½ ounce of Lugol's solution to the quart of water. These irrigations are done two or three times a week. Later on, with a wide cervical canal the uterus is irrigated and tincture of iodin or 5 to 10 per cent. chlorid of zinc is applied. In other instances medicated sticks containing iodoform or protargol are introduced

into the uterus two or three times a week. In the treatment of chronic and subacute gonorrhea, although some dilate the cervix and make use of the above methods, it is wiser to use no intrauterine treatment. Every stubborn uterine catarrh which resists treatment is probably due to pyogenic micro-organisms. We then depend on the use of the cold douches, the use of boroglycerin and gauze, the administration of sitz-baths, suction (Fig. 13), the use of tonics, and such an arrangement of the patient's life as will increase her physical resistance.

In gonorrhea in pregnancy there should be no local treatment, except perhaps douches, and the patient should stay in bed four to five weeks after labor, until complete involution takes place.

Senile endometritis demands treatment of the associated vaginitis. This is accomplished by washing the vagina three times a week with pure pyroligneous acid applied through the Ferguson speculum. Douches consisting of 1 tablespoonful of pyroligneous acid to the quart of water should be taken once or twice daily. For the endometritis itself intrauterine irrigations of 1 per cent. tincture of iodin are the best. The uterus must be hardened or made resistant to the action of the bacteria. This is best accomplished by the use of tepid water, and later on cold water, in the employment of the vaginal douches, the temperature being gradually diminished in the course of a few weeks. The douches should be copious and consist of several quarts.

In all cases of catarrhal secretion from the uterus associated with descent of the uterus or with retrodisplacement, especially if the uterus is large, a pessary should be introduced, or the patient operated upon. In addition, pelvic congestion should be corrected by sitz-baths, Nauheim baths, and the use of the sinusoidal current applied to the abdomen. Constipation should be corrected by the methods mentioned in the section on Constipation, for all these procedures diminish pelvic congestion and stasis and aid in establishing a better general circulation. The use of the pessary is, of course, contraindicated with periuterine inflammation or adhesions.

In all cases of discharge from the uterus, in women approaching or past the menopause, whether of a serous or a serosanguine-

ous or purulent nature, and especially if the discharge has a fetid character, the existence of carcinoma must be considered. Carcinoma of the fundus may remain for months, and even years, more or less localized in the uterus and with very late extension into the connective tissue of the broad ligament. In the early stages especially, enlargement of the uterus is not present. The diagnosis can be made from uterine scrapings, repeated if the symptoms persist and if hemorrhage continues or becomes worse.

PRURITUS VULVÆ

Pruritus vulvæ is generally known as an affection of the external genitalia, characterized by the sensation of burning and itching and irritation. The pruritus is only a symptom. It has been commonly divided and classified, according to the cause, into a constitutional, a nervous, and a local form. Constitutional forms are due to icterus, diabetes, gout, or chronic toxemia. The pruritus vulvæ due to a general condition such as icterus is only part of a diffuse pruritus and evidences no local change, but when due to diabetes is generally characterized by a typical skin alteration of color and character and by local annoyances.

The changes in the character and color of the labia and vulva are so typical in the pruritus associated with *diabetes* that when well marked they cannot be mistaken. The entire skin or mucous covering of the larger and especially of the smaller labia and the clitoris has a thickened, shiny, leathery, glazed look. There is a suggestion of solid edema, but the bronze or copper color is characteristic. Occasionally there is only furunculosis.

In the vulva as well as in other parts of the body disturbances of metabolism and gouty or other diatheses may be responsible for various eczematous skin changes. A local eczematous change may produce redness and swelling of the labia majora, minora, and vestibule, and may extend out to the groins. In the moist form the parts are agglutinated; in the dry form they are not.

The *nervous form* of pruritus, if local, is due to involvement of the nerve-ends in the vulva, but is without evidence of primary local inflammation or alteration, and represents changes in the nerve-ends like those that occur in neuralgia. According to Webster, there is a fibrosis of the nerve-ends.

Aside from this fibrosis of the nerve-ends, local forms of pruritus are due to irritations, to vulvitis or vaginitis, to cervical catarrh, to uterine discharge, and to skin affections.

Pruritus may result from *masturbation.* Onanie may affect the sebaceous glands on the inner surface of the small labia and in the vestibule. There is often evidenced a lengthening of the labia and clitoris, and also a granular uneven character of the surface of the small labia and the vestibule. The vestibule may be greatly congested. The itching ceases only when masturbation is stopped.

Local uncleanliness, perspiration, or friction of the parts may cause an intertrigo or sore condition of the skin. A *dermatitis*, especially in fat women, may be present on the inner surface of the thighs and may spread to the vulva. An acute dermatitis is produced by chemical or other irritation acting on the skin, and improves on removal of the cause.

Intertrigo is characterized by its occurrence at points of contact of skin surfaces. There is at first a marked secretion from the skin glands and a maceration of the epidermis. Then the skin becomes dark red, moist, warm, and sensitive. There are heat and pain. On this basis an eczema readily develops.

Eczema is a chronic, itching, desquamating skin affection which is either moist (serofibrinous exudation) or dry (growth of epidermis or fatty secretion).

The irritation of *abnormal urine*, especially urine containing bacteria, or ammoniacal urine, may cause itching. In reviewing the history of numerous cases of pruritus vulvæ, it is noted that patients often mention a frequency of urination. Close questioning often discloses the fact that urinary annoyances and vaginal discharge were noted at the same time. This concomitant bladder condition, known as irritable bladder, must be distinguished clinically from the more severe forms known as cystitis. That certain forms of cystitis cause a decided vulvitis and pruritus is certain. The connection between some of these urinary disturbances and the milder forms of pruritus is evidenced by their clearing up after appropriate treatment. The urine and its contained bacteria and other abnormal constituents may produce local vulvar irritations.

There are cases in which the *rectum* is perhaps the causal influence, for it is quite certain that after constipation, especially

on the use of enemata, or after diarrhea, the means of infecting certain areas of the genital tract are present. This is often the case in older patients with lacerated perineum and in those careless as to personal cleanliness. The use of tiolet paper from behind forward may transmit bacteria from the anus to the vulva. This factor plays a part in infecting the bladder.

Pruritus is generally present with acute gonorrheal vulvitis. It is often present with other forms of *vulvitis*. It will be found that marked lesions are sometimes present and often absent. There may be diffuse reddening of the external genitalia. The smaller labia may evidence a hypersecretion of the sebaceous follicles or there may be a minute granular roughening or smaller or larger lesions resembling herpes or pemphigus. In chronic vulvitis changes may take place in the papillary bodies and produce evident alterations in the fossa navicularis, in the hymen, or about the urethra.

Tissue changes are present in the pruritus so often found in the climacterium, which is experienced as a burning and itching, especially annoying at night. There is in particular a local change which affects the smaller and the larger labia and the clitoris. This typical form associated with visible alterations is known as a *vulvitis pruriginosa*. Pruritus is also a symptom of the rare local atrophic condition known as kraurosis vulvæ.

In *kraurosis* there is atrophy of the corium of the larger and smaller labia and of the introitus. There are white spots on the surface, which later takes on a sclerotic character. The mucous membrane becomes gray, white and atrophic, and the smaller labia and the clitoris shrink. The larger labia appear flat and the smaller labia seem almost absent. Narrowing of the introitus results.

Kraurosis vulvæ differs from vulvitis pruriginosa in two respects: (1) there is a decided narrowing of the introitus; (2) the atrophic condition of the skin is marked. In vulvitis pruriginosa the skin is not atrophic, but is folded and red or bluish in color.

Pruritus vulvæ is often secondary to irritation produced in the vagina by the gonococcus, the leptothrix vaginalis, the oidium albicans, by the bacterium coli, etc. Inflammation of the

vagina in the early stages shows a red mucous surface, red papillæ, and discharge. A frequent form of pruritus vulvæ, then, is that due to non-gonorrheal leukorrhea of the nature of either a hypersecretion or of an inflammatory character. In younger women acute vaginitis is in almost all cases gonorrheal in origin. When pruritus is present with an acute gonorrheal affection, it is of little importance in making the diagnosis, for other symptoms attract more attention. When, however, the acuteness of the condition has subsided, isolated remains of the local alterations are of corroborative value. A purulent urethritis, spotted areas of redness on the vulva, infection of the glands of Bartholin, the flea-bite redness about the opening of the ducts of Bartholin, red eroded areas in the fourchet, small red papillary areas in the vagina, and inflammatory involvement of the cervix all speak for the gonorrheal nature. After the acute symptoms have disappeared, such evidences may be entirely absent below the cervix, and yet pruritus is present.

We must also recognize the *senile form of vaginitis*, in which there is often a diffuse, red, irritative or non-ulcerative condition due to the growth of bacteria on senile tissues of lessened resistance. The bacteria producing such conditions do not, as a rule, cause these irritations in younger women with more resistance epithelium. The bacteria coli, together with yeasts, are probably important factors in the production of this senile condition of which pruritus is a symptom. The wearing of rings to relieve prolapse or cystocele always increases the vaginal irritation and intensifies the pruritus.

Pruritus may be the result of a discharge coming from the *cervix or uterus*. Catarrh of the cervix or uterus may produce a secretion of an exceedingly irritative nature. With an originally subacute involvement of the cervix, local objective vaginal and vulvar signs are generally absent, and pruritus in a certain number of cases may be the only symptom, and the discharge the only objective evidence.

Another cause of leukorrhea and pruritus, but itself probably due to bacterial influence, is erosion of the cervix, which is always associated with an endocervicitis.

Uterine leukorrhea due to catarrhal or gonorrheal endometritis, and the secretions resulting from a degenerating fibroma or from a carcinoma of the cervix or uterus or associated with senile endometritis, are capable of causing pruritus vulvæ or vulvitis.

In pregnancy an increased vaginal secretion containing bacteria of various forms is occasionally productive of vulvar itching and burning.

TREATMENT OF PRURITUS

Pruritus due to pediculi should be treated by a shaving of the parts and by the application of blue ointment or gauze soaked in 1:5000 oxycyanide of mercury.

If the pruritus takes its origin from the rectum, cleanliness is essential, and the anal area should be thoroughly washed. After a thorough use of soapsuds, a 1 per cent. carbolic salve should be applied about the anal area.

In the pruritus secondary to bladder involvement or alterations in the constituents of the urine, and so associated with frequency of urination, the bladder should be washed with boracic solution followed by the instillation of several ounces of a 1 per cent. solution of ichthyol, which the patient is to retain as long as possible. With more active cystitis, the bladder should be washed with boracic solution, and four or five ounces of a 0.5 per cent. solution of carbolic acid, or a 1:10,000 nitrate of silver solution injected into the bladder. This treatment should be carried out twice a week. Internally, sandalwood oil, 5 minims, and salol, 5 grains, should be taken every 4 hours.

In cases of pruritus due to a vaginitis manifested by a more or less profuse leukorrhea, a Ferguson speculum should be used, and the vagina washed thoroughly with cotton sponges soaked in a 1 per cent. solution of lysol. Then there is poured into the speculum a 1 per cent. solution of bichlorid of mercury, rendered acid by the addition of a few drops of hydrochloric acid; or else pyroligneous acid or tincture of iodin are poured in. By moving the speculum forward slowly, the entire vaginal canal is bathed for one minute and then dried by cotton. A long tampon is then introduced, made and prepared as follows: absorbent cotton is rolled to a thickness approaching

the diameter of the speculum and 4 to 5 inches in length. This is covered with a double layer of sterilized gauze and fastened at either end by a string tied about it, one of the strings left long for the purpose of removing the tampon. The gauze is dusted thoroughly on all sides with a powder composed of 1 part alum and 4 parts boracic acid, the proportion of alum being increased when a more decided desiccation and desquamation of the vaginal lining is desired. This tampon is introduced through the speculum and kept in place for twenty-four hours. In this manner the application is made equally to all parts of the vagina, and the secretion is so absorbed that on removal of the tampon the vagina is found to be dry. When the tampon is removed at the end of twenty-four hours a douche of one tablespoonful of formalin to the quart of water, twice a day, may be given. Better results are often gained without douches of any sort. Draining the vagina and keeping it dry are of decided value. It is often astonishing how rapidly a pruritus and a leukorrhea disappear after this treatment. Involvements of the cervix and uterus demand the treatment mentioned under Leukorrhea.

Local applications are used for the purpose of healing any evident alterations and for the purpose of diminishing the sensitiveness of the nerve-ends. Watery solutions include 2 to 5 per cent. carbolic, dilute acetate of lead, 1 to 20 per cent. nitrate of silver. Salves include a 10 per cent. calomel ointment; 5 to 10 per cent. cocain salve (cocain 1 dram, lanolin 1 ounce, olive oil 2 drams); or menthol ointment (menthol ½ dram, olive oil 2 drams, lanolin 1 ounce); a carbolic ointment, containing 15 grains of carbolic acid, to 1 ounce of unguentum zinci oxidi; a 10 per cent. ointment of anesthesin.

For pruritus without external alterations:

℞. Cocain ..... ℥j
Ol. oliv ..... ℥ij
Lanolin ..... ℥j
M. S.—External use.

℞. Menthol ..... ℥ss
Ol. oliv ..... ℥ij
Lanolin ..... ℥j
M. S.—External use.

℞. Acidi carbolici..... gr. xv
Ung. zinci oxidi..... ℥j
M. S.—For external use.

Many observers report brilliant results in these cases from the use of the mercury quartz lamp.

Intertrigo demands the following (Unna):

℞. Zinci oxidi..... ℥iiiss
Sulph. præcip..... ℥iiss
Mag. silicat..... ℥j
Ol. paraffin alb..... ℥iij
Adip. benzoinat..... ℥ij
M. f. past.
S.—External use.

To this 5 per cent. of ichthyol may be added if pustules are present:

℞. Calc. carb. præcip..... ℥v
Zinci oxidi..... ℥v
Ol. lini..... ℥j
Aq. calcis..... ℥j
M. f. past.
S.—External use.

Simple eczema, characterized by a red, rough, dry epidermis, demands the use of zinc oxid ointment, to which may be added 5 per cent. of ichthyol or 2 per cent. of resorcin. If the eczema is of a papulovesicular type (Unna):

℞. Resorcin..... ℥j
Ichthyol..... ℥j
Acidi salicylici..... gr. xx
Vaselini..... ℥iiss
M. f. unguent.
S.—External use.

If the eczema is of a horny, callous nature through scratching and mechanical irritation of a simple eczema (as may happen on the large labia), or for any itching or pain (Unna):

℞. Ammonii sulphoichthyoli (Thigenol)..... gr. xxx
Aquæ..... ℥iiss
Glycerini..... ℥iiss
Dextrini..... ℥iiss
M. f. past.

Or:

℞. Ung. diachylon (Hebra) ..... ℥j
Vaselini ..... ℥ij
Liantral ..... gr. xv
Ext. cannabis indic ..... gr. xv
M. f. unguent.
S.—External use.

Because of the eczematous nature of many of the simple cases, the following paste is of value. It consists of salicylic acid 15 grains, amylum 5 drams, oxid of zinc 6 drams and of vaselin and lanolin an ounce and a half.

℞. Acidi salicylici ..... gr. xv
Amyli ..... ℥v
Zinci oxidi ..... ℥vj
Lanolini ..... ℥vj
Petrolati ..... ℥vj
M. S.—For external use.

It is in these conditions of intertrigo and eczema that the parts should be kept as free as possible of water and cleansing should be done with olive oil. If a moist sponge be used first, it should be followed by a cleansing with olive oil. If salves fail, a dusting-powder should be used. A good one consists of menthol 15 grains, salicylic acid ½ dram, oxid of zinc 2 drams, amylum and talcum 5 drams. Stubborn cases demand the aid of a dermatologist, for a thorough desquamation of the horny layer must be caused by a strong resorcin paste, followed by subsequent treatment of a special nature.

℞. Menthol ..... gr. xv
Acidi salicyl ..... ℥ss
Zinci oxidi ..... ℥ij
Amyli ..... ℥iiss
Talci ..... ℥iiss
M. S.—Externally as dusting-powder.

℞. Acidi carbolici ..... gr. xxx
Calomel ..... ℥j
Pix liquida ..... ℥iss
Menthol ..... gr. xx
Zinci oxidi ..... ℥ij
Lanolin ..... ℥ij
S.—Rub actively into the skin twice daily after bathing with hot water.

Attention should be paid to the diet. Autointoxication should be overcome; tea, coffee, alcohol, and opium should be prohibited. Internally Fowler's solution and the compound syrup of hypophosphites should be administered.

John J. Reid advises the use of pilocarpin for its specific effect in different forms of pruritus. The ordinary dose is one-quarter of a grain, to be given only when the itching manifests itself, and not to be repeated until the itching returns. It is well to begin with one-eighth of a grain, owing to individual susceptibility. The addition of $\frac{1}{100}$ grain of atropin prevents sweating. The pilocarpin is given by mouth.

In the *diabetic* form the diabetes itself must be treated. Codein, aside from its action on the diabetes, diminishes the itching. Hyperglycemia is rapidly diminished by hypodermic injections of insulin, twice daily. The itching disappears in direct proportion to the reduction of the blood sugar. Douches should be taken, twice daily, of a dram of acetate of aluminum to 2 quarts of water. The vulva should be washed thoroughly with soap and water and then flushed with normal saline solution. It should then be thoroughly washed with a 1:5000 mercury oxycyanid solution and carefully dried. With a Ferguson speculum the vagina can be painted with a 1 per cent. nitrate of silver solution. Then a bismuth-oxid-of-zinc ointment should be applied several times a day. Office treatment must be carried out twice a week.

The ointment to be applied contains 1 dram of bismuth subnitrate to an ounce of oxid of zinc ointment.

Kraurosis.—The vulva should be shaved and thoroughly cleansed with soap and water and painted with tincture of iodin once a week. Compresses of 5 per cent. creolin should be used.

Some cases not relieved by treatment demand surgical removal of the affected area.

VAGINISMUS

Vaginismus is a reflex cramp or spastic contraction of the constrictor cunni alone, often also of the levator ani and transversus perinei, or of all the muscles of the pelvic floor, which is caused by the attempt at or by the actual beginning of coitus, and which prevents coitus. It may be due to unusual sensitiveness of the vulva or to actual lesions of the hymen and vulva produced by coitus, and which make renewed attempts immediately after marriage painful. It is a condition acquired also as the result of infections which cause vulvitis or breaks in the tissues and fissures. In some cases a very narrow vulva, or, as Sims pointed out, an abnormally high or low position of the vulva, is indirectly responsible for vaginismus.

In addition to the spastic contraction of the muscles reflexly produced from the sensitive or irritated structures of the vulva, the same condition is caused by the mental condition and attitude of the patient, and is associated with contraction of the adductors of the thighs. There is in many of these cases a psychic anxiety, especially after previous unsuccessful or painful attempts at coitus. Nervousness on the part of the male, and inability to overcome the nervousness on the part of the female, with resulting fruitless attempts at penetration, plus early emission, increase the nervous tendency and result not infrequently in the production of an acquired neurosis in the female and also in the male. Often this condition is of considerable importance. This element is not infrequently noted in nervous, hysterical, hypersensitive, and sexually modest women, and, as Veit says, is rarely observed among the lower classes.

Treatment.—Treatment consists in ordering freedom from coitus until the patient becomes quieter. The nerves should be treated by rest, bromids, and the glycerophosphates of lime and soda. Attention should be paid to the treatment of local

alterations. Examination in these cases is often difficult and must sometimes be done under anesthesia. Gentleness in some cases and sternness in others generally permits, however, of examination, which is essential in determining whether we are dealing with a rigid hymen, an unusually sensitive hymen, with visible lesions of the vulva, etc., or whether we are dealing with spastic contractions due to and associated with a state of nervousness and psychic anxiety. In some cases it is necessary to excise the hymen. In other cases the method of Sims and Dührssen is used, for the purpose of making two lateral incisions, partially or completely separating the constrictor cunni. This is followed by gradual dilatation, done with the fingers or with large glass plugs left in place for an hour. This gradual dilatation, using constantly larger tubular specula, should be done with the preliminary use of cocain ointment to avoid pain. Avoidance of pain in the treatment of these cases is very important to allay the anxiety and fear associated with the thought of any approach to the vulvar area. *A great deal may often be accomplished by discussing the matter frankly with the patient's husband. He should be urged to be careful, gentle, and considerate when coitus is attempted.*

DYSPAREUNIA

Dyspareunia means pain accompanying coitus. This may be due to inflammatory conditions in the urethra, the presence of urethral caruncles, a resistant hymen, or the existence of an acute or chronic vulvitis. It may be due to a vaginitis. More frequently, however, the cause is located higher up, and is to be sought in an inflammation or infiltration of the connective tissue of the pelvis or an involvement of the peritoneally covered organs. A parametritis, either lateral or posterior, is not infrequently productive of pain on coitus. The most frequent causes, however, are peritoneal adhesions associated with a salpingitis or pyosalpinx, with a perioöphoritis or with fixed retroflexion. It is naturally to be expected that congestion and the pressure on the pelvic viscera produced by coitus, and which therefore exerts a tugging effect on adhesions, will be productive of pain. Dyspareunia in the strict sense is an acquired condition,

coming on weeks or months after marriage, or after labor or child-birth, and in this the time element differs, so far as the vulvar causes are concerned, from vaginismus.

COCCYGODYNIA

Coccygodynia implies an alteration in the coccyx or its periosteal covering, or in the muscles and fascia connected with it, as a result of which pain occurs whenever tension or pressure on the coccyx or its attached structures takes place. This condition may occur as the result of a fall or kick which produces a fracture or dislocation of the bone.

According to Grandin, caries of the bone is a very frequent cause. In many cases the condition appears to be due to a localized rheumatic or gouty condition. In some of the cases the pressure effects of labor, especially if associated with the use of forceps, may have been the cause. In many instances the cause must be referred to those inflammatory chronic diseases of the cervix and uterus with which a progressive cellulitis is associated. Pain is felt on sitting, and on the muscular contraction associated with rising from a sitting position or with the pressure exerted on defecation. On examination through the vagina or through the rectum, pressure on the tip of the coccyx and on the muscles attached to it reproduces the pain. Pressure exerted on the posterior surface of the lower end of the sacrum and the tip of the coccyx is productive of pain. The coccyx may be felt in some cases to be bent at right angles. In other instances coccygodynia is part of a general nervous or neurasthenic state. Syphilis is another cause.

Treatment.—Severe cases, which are sensitive to pressure, as a rule, are cured only by resection of the coccyx, with or without separation of the muscles attached to the lateral periosteal covering of the coccyx. In other less severe instances, tonic treatment, antirheumatic treatment, and medication and diet looking to the correction of a gouty diathesis are of value. Bromids, the coal-tar products, and codein are of aid in relieving pain. Hydrotherapy is of value for a general tonic effect. In all cases evidencing cervical or uterine discharge, gauze and glycerin treatment per vaginam should be used.

SIGNIFICANCE OF PELVIC PAIN

The pain from which women may suffer may be acute when it occurs for the first time; it may be of repeated acute nature; it may be continuous or steadily progressive, or it may be associated only with the menstrual period.

In the first class we have ectopic gestation, ovarian tumors with twisted pedicle, etc., acute inflammatory involvement of the uterus, tubes, and peritoneum, and appendicitis. The two latter, when acute in their character, are associated with pain, abdominal tenderness and rigidity, and other evidences of localized or general peritonitis.

Ectopic Gestation.—The two symptoms of greatest value are (*a*) atypical menstruation, or metrorrhagia, (*b*) pain.

The pain of ectopic gestation in the early weeks is indefinite, felt on one side or in the pelvis, which later on assumes a colicky nature. This colicky pain is an evidence that there is bleeding into the tube or into the peritoneum.

The colicky sharp pains of ectopic gestation are generally closely attended by the appearance of a bloody discharge from the vagina. If the colics are very severe, with steady pains between them, the abdominal walls may be rigid. The colics in the beginning of tubal pregnancy are often mistaken for intestinal pains. They may not cause the patient to rest more than momentarily from her work or pleasure. In other cases the pains are so severe and agonizing that a physician is called at once. Soreness of the abdomen may pass off in an hour or less after a severe ectopic gestation colic, or it may be so prolonged as to prevent the patient from walking for a day or two, or longer. Occasionally jars of the body in walking, or excessive physical activity, cause so much pain that the patient remains in bed for a while. In such cases the colics may return after shorter or longer intervals.

If the patient has been accustomed to painful menstruation, we should analyze the character of her dysmenorrhea, and ask her particularly if the pains which appear in connection with the blood at this time are the same as the usual pains of her dysmenorrhea. If the patient is intelligent, she will recognize the difference in the character of the pains, and she will at once

state wherein the pains and the flow of her present attack differ from her previous and painful menstruations. If the patient volunteers a diagnosis of miscarriage and she is still bleeding and has pains, we should be slow to accept such a statement, unless a fetus has actually been seen by some one.

The diagnosis is made from the history, from general symptoms, from atypical bleeding, and by bimanual examination.

A pregnant tube is always tender when squeezed, and may be extremely painful when palpated. Examination per rectum discloses an enlarged, painful, sensitive tube. The tube may be embedded in blood-clots, or so displaced, or partly or completely engulfed in hematocele, that its form and size are indistinguishable. Morning sickness and enlargement of the breasts, which are the ordinary symptoms of intrauterine pregnancy, do not belong to the symptomatology of the extrauterine pregnancy.

Tubal rupture is sometimes associated with a very sharp agonizing pain, felt on one side and associated with the symptoms of internal hemorrhage. Mild or severe attacks of pain when tubal abortion or rupture takes place are associated with rapid pulse, pallor, attacks of fainting and syncope, and subnormal temperature. There is, however, in some cases a rise of temperature to 100° or 101° F., and even as high as 103° F., due to the absorption of the fibrin elements of the blood. The pain in tubal abortion or tubal rupture is sometimes of a diffuse nature, and sometimes is felt so high up in the abdomen as to simulate an affection of the gall-bladder.

The tragic stage of the disease is characterized by severe colics, pallor of the skin, weak and rapid pulse, a fall of temperature one, two, or three degrees below normal, rapid breathing, fainting, generally vomiting and restlessness, and sometimes a lethargic condition from which the patient may be aroused. In this tragic stage the pulse may be anywhere from 120 to 180. It may not be possible to count it at the wrist, although its flickerings may be perceived until shortly before death (Harris).

Ovarian Cyst.—Ovarian cyst with twisted pedicle is associated with a sharp sudden pain on one side or the other, which

continues with evidences of abdominal tenderness and rigidity. The excruciating colics, the steady pain, the soreness of the abdomen, and the fact that it springs from one side of the pelvis, together with the metrorrhagia which so often follows the twisting of a pedicle, afford one of the best counterfeits of ectopic gestation. Such cases are, of course, comparatively rare, and are not difficult to diagnosticate unless the tumor which is twisted on its pedicle was not known to exist prior to the colics, and to the atypical menstruation. In ovarian cysts with twisted pedicle the last menstruation is not usually belated. If the twist is marked, hemorrhage occurs in the cyst and in the pedicle, and degeneration of tissue occurs, associated at first with localized peritonitis and accompanied with such abdominal distention and rigidity of the abdominal wall that bimanual examination often determines the diagnosis with difficulty. Continuation of this condition may lead to a more general peritonitis. Adhesion of the ovarian cyst to the surrounding structures occurs early.

Metro-endometritis.—Acute metritis or metro-endometritis, not associated with pregnancy or abortion, is usually of gonorrheal origin. Involvement of the endometrium itself causes very few symptoms, but involvement of the uterine wall causes a sense of weight and fullness in the pelvis. Tenderness is felt in the lower abdomen, and there is sensitiveness on moving or jarring, with colicky pains due to uterine contractions. Even in the apparently localized cases there is probably some involvement of the tubes, and perhaps of the peritoneum. There is fever and rise in the pulse-rate, and examination shows an enlarged sensitive uterus, from which is discharged a greenish, thick pus containing pyogenic cocci.

The same pain, but less severe, is present in the chronic stage, or in subacute cases. Acquired uterine dysmenorrhea often results. Occasionally, pelvic pain is experienced between menstrual periods, generally in the uterus, but the pain is often referred to the umbilical region or toward the ribs. The uterine pains are due to uterine contractions and, when experienced between periods, are probably due to retention of secretion with resulting uterine irritation. More frequently

than pain, there is noted a sensation of pressure in the pelvis, frequent desire for defecation and urination, pain in the back and in both legs. These are due to the associated pelvic congestion acting on the uterus, ligaments, and connective tissue made sensitive by inflammation and infiltration.

Uterine inflammation with associated pelvic inflammation may cause severe pain, felt from the crest of the ilium down along the course of the sciatic nerve. Pain may in some cases be felt in the lumbar region and at other times in the region of the pubes. Practically the same symptoms are present with the milder forms of involvement by the other cocci and bacteria which produce infections post partum and after abortion or with intrauterine manifestations.

Pelvic Peritonitis.—When an acute inflammation extends into the tubes and involves the peritoneum, and is productive of pyosalpinx and of localized peritonitis, the symptoms are those of a severe pelvic peritonitis associated with marked pain and tenderness, with abdominal distention, elevate temperature, etc. Bimanual examination shows a mass on one or both sides of the uterus, but in some cases, with much purulent exudation, the tubes and ovaries cannot be identified. Practically the same symptoms are present with the pelvic peritoneal involvement produced by the other cocci and bacteria which produce infection post partum or after abortion or intrauterine manipulation. On the other hand, a non-virulent latent gonorrhea may extend gradually through the tubes, may involve the peritoneum and produce extensive adhesions without acute onset. Its cause may be slow and gradual and may affect the patient's general health long before pelvic symptoms are annoying enough to attract attention.

Recurrent attacks of severe pelvic peritoneal pain may be due to recurring attacks of appendicitis, but are usually due to recurrences or exacerbations of a localized pelvic peritonitis originally due to the upward extension of a gonorrheal infection through the Fallopian tubes. This is most commonly noted in gonorrheal infections of the nature of pyosalpinx. Exertion, lifting, and other conditions cause an opening of the tube and the pouring out of more pus into the peritoneal cavity. This

occurrence is associated each time with a new attack of pelvic peritonitis. Wertheim says that this recurrence of attacks may be due to the invasion of the peritoneum by gonococci which have passed through the tube wall.

Acute Parametritis.—Pain localized in one side or the other may be due to a rapid or slow infiltration of one or other of the broad ligaments by an acute or subacute cellulitis, either serous, serofibrinous, or purulent. Even in the early stages this condition can be made out by bimanual examination, when a mass will be felt on one side of the uterus, extending gradually over toward the pelvis, and in the later stages producing a bulging into the fornix and extending upward so that the upper rounded borders can be made out through the abdomen above Poupart's ligament. An affection of the broad ligament or of the posterior parametrium may occur in this acute fashion after labor, also after abortion, and also after operations on the cervix, especially if this cervical operation is preceded by forcible dilatation. On the other hand, these conditions, especially the involvement of the posterior parametrium, may occur as a slow progressive involvement associated with cervical catarrh, or may come on gradually after labor

Salpingo-oöphoritis.—Gradually oncoming, or progressively more intense, pain, felt on one side or the other or both, is usually due to a slow upward extension of an infection through the Fallopian tubes, or to the organization of adhesions long subsequent to subacute or severe attacks of pelvic peritonitis. This condition is a frequent cause of unilateral or bilateral pain in women. It is extremely frequent in women who are sterile and in uniparæ. It constitutes a one or both sided salpingo-oöphoritis. The tube is somewhat swollen, the outer end is closed or covered by adhesions, the ovary is cystic and covered by adhesions, and the tube and ovary are adherent to the posterior wall of the broad ligament. It is often noted in women who have been curetted for sterility. Its etiology is to be sought in an upward extension of an inflammation resulting from the curettage and due to the ordinary septic bacteria of mild virulence, or more frequently to the gonococci present but unrecognized. Curettage is often done for cervical catarrh

and for uterine catarrh, and these operations not infrequently result in a mild salpingo-oöphoritis. After abortion or labor pain may come on early, with an acute or subacute infection. If it comes on gradually and later, it is due to the upward extension of an infection from the uterus. A slow infection of the peritoneum is typical of a latent gonorrhea.

Pelvic Tuberculosis.—A large percentage of the tubes removed for inflammatory diseases are tubercular. The *tubes* are infected from the peritoneum or from other internal organs, or through the medium of the blood or by infection from below. The tubes are involved in 30 to 40 per cent. of the cases of tubercular peritonitis. The abdominal end is most frequently affected and both tubes are involved to the same degree.

(*a*) The miliary form gives an appearance like that noted in catarrhal salpingitis. (*b*) The local diffuse form is most frequent. The tubes are thickened and filled with a cheesy matter. The adhesions are marked and involve the uterus and the sac of Douglas, the sigmoid, and the rectum. The tubes vary from the size of a walnut to that of a lemon. If pus is present, the infection is generally a mixed one, the bacteria being either the gonococcus or the pyogenic bacteria. (*c*) The tubes are enlarged, thickened, and hard, and constitute the fibroid form (Maylard).

The symptoms are menorrhagia, metrorrhagia, and dysmenorrhea. With mixed infection fever is present. The diagnosis is difficult. This form probably constitutes a fair percentage of the tubal diseases in the virgin characterized by the symptoms of salpingitis and a slight rise of evening temperature.

Ovarian involvement by tuberculosis is usually bilateral. There may be a peri-oöphoritis with tubercles on the outer surface of the ovary; or, miliary tubercles in the stroma of the ovaries; or, discrete or confluent foci of caseating material. The ovaries are usually bound together with the tubes.

Tubercular peritonitis is four times as frequent in the female as in the male, and this is said to be due to the infection of the tubes. The general primary seat, however, is in the bronchial

glands, lungs, and pleura. There need be no tuberculosis of the intestines, for the bacilli may pass through the intestinal wall, or from the retroperitoneal lymphatic glands, or may be carried through the lymphatics or through the blood from the lungs or joints.

The peritoneum may become infected from the tubes, from the intestine, or from the retroperitoneal lymphatic glands. The symptoms of tubal involvement are those of salpingitis or of pyosalpinx; sometimes characterized by recurrent attacks of localized peritonitis. Fluid, if it accumulates at all, gathers gradually.

The larger number of cases of tubercular peritonitis are characterized by the symptoms of pyosalpinx or of ovarian cyst. The latter is the case if the tubercular peritonitis is associated with the accumulation of fluid. Tubercular peritonitis is then of the serous, ascitic form. The onset may be insidious, with the symptoms of tenderness and colicky attacks and sense of fulness. The onset may, however, be sudden. The symptoms are then acute, associated with pain and tenderness, and the abdomen fills with fluid in a few days. The accumulation of fluid may be localized or encysted.

Another form of peritonitis is the dry one, associated with adhesions, and called the adhesive or fibroplastic form.

The Relation of Appendicitis to Pelvic Annoyances.—There are conditions occurring in the right lower quadrant of the abdomen which at times so simulate each other as to symptomatology that, in the early stages especially, a differential diagnosis is ofttimes difficult. Certain cases of ectopic gestation and ovarian cysts with twisted pedicles may render a differential diagnosis from appendicitis necessary, but the most frequent conditions in which doubt exists are acute, subacute, and chronic appendicitis as distinguished from acute, subacute, and chronic inflammatory diseases of the adnexa. In so far as the appendix and in part the adnexa are covered by the peritoneum, any infection of the peritoneum may involve both of these areas. For the very same reason the element of physical contact comes into play. There are instances of inflammatory involvement of the appendix in

which this structure is so situated that it becomes attached to the uterus, to the tube, or to the ovary. There are, on the other hand, conditions involving the tube and ovary, and even the uterus, in which adhesion of primarily uninflamed appendix to these structures results. This anatomic proximity not alone brings these structures into relation, but makes the differential diagnosis at times difficult.

There are cases of *acute gonorrheal involvement of the tubes* with more or less extensive peritonitis in which the differential diagnosis from appendicitis must be made.

Patients are attacked suddenly with pelvic and abdominal pain, rise of temperature, etc., and the diagnosis of appendicitis is almost excusable. Vaginal examination plus the examination of the cervico-uterine secretion by microscope aids in making the correct diagnosis. In such cases there is a double pyosalpingitis, the omentum is often adherent to the uterus or adnexa, and the sigmoid and its epiploicæ are likewise involved. The outer ends of the tubes are generally adherent to the posterior wall of the broad ligament. The intestines and peritoneum are not markedly injected. The uterus seems large and soft, like the pregnant uterus.

The uterus may be movable, or retroflexed and fixed, and there may be unilateral or bilateral pyosalpingitis. More pain is experienced on the right side because the ovary and broad ligament of that side are involved and because the ovary is fixed near the pelvic brim. Even the sigmoid may be adherent to the right pelvic brim and sometimes physical examination leads to the diagnosis of chronic appendicitis. In such cases the appendix and the meso-appendix are almost certain to be involved in the inflammatory adhesions.

So far as the appendix with its peritoneal covering is concerned, it is perfectly natural, as we have seen, to expect that inflammatory involvement of the adnexa with which a peritonitis is associated may by contact or direct continuity involve the appendix together with other intestinal structures in peritoneal adhesions. An important question is, Do milder inflammatory diseases of the adnexa cause appendicitis?

Continuing out from the broad ligament along its upper border and extending to the lateral wall of the pelvis and running up practically to the base of the appendix, is situated the right ligamentum infundibulopelvicum. This structure, as well as the broad ligament, is rich in lymphatics, and it has been stated that involvement of the adnexa may cause an extension of bacteria through these lymphatics up to and involving the appendix. While this opinion has been expressed by more than one observer, it must be remembered that appendicitis is an affection which occurs from the lumen of that structure, and that bacteria, if they do pass up through these lymphatics, may and do cause infiltration or induration about the cecum and the mesoappendix, but cannot be responsible for the occurrence of acute or subacute appendicitis. Those men who make it a routine practice to remove the appendix in all abdominal gynecologic operations are in a position to verify this assertion. We have not been able to find a causal relation occurring by this path of lymphatic extension, and agree with Boldt, that inflammatory diseases of the adnexa do not produce inflammatory involvements of the mucous membrane of the appendix.

Inflammatory changes of a marked nature may be present in the tubes, ovaries, and broad ligaments, and yet the associated peritonitis and peritoneal adhesions are usually slight. In such cases the connective tissue of the broad ligaments may be involved. Yet with such a chronic alteration in the broad ligament lymphatics the appendix is found to be normal. Were the lymphatic connection with the appendix a ready source of involvement of the latter structure, we should find more evidences of this relation on operation.

The question under discussion takes on a quite different phase when we consider diseases of the adnexa as possible sequelæ of appendicitis. Take, for instance, the question of *tuberculosis*. Tuberculosis of the tube and ovary may occur by upward extension of tubercle bacilli through the cervix, or tubercle bacilli may be deposited through the medium of the circulation, or tubercle bacilli may involve the tube and ovary subsequent to their presence in the peritoneal cavity. Whatever

may be said as to the occurrence of such an infection through the first two channels, it is undoubtedly true that in the vast majority of instances tuberculous involvement of the appendages occurs subsequent to the presence of tubercle bacilli in the peritoneal cavity, with or without microscopic evidences of tubercular peritonitis. The tubercle bacilli, when present in the peritoneal plasma, are carried into the tube lumen by the action of ciliated epithelium, and however much or little the peritoneal covering may be involved by tuberculosis, the lumen of one or both tubes is rarely ever free of tubercles. I had the opportunity on one occasion to make microscopic sections in a case of tuberculosis of the adnexa in which the appendix was removed. The appendix on examination contained tubercles and giant cells, and they were not present on the peritoneal surface, but were present in the structure and lumen of the tube, so that the tuberculous appendicitis was part of the primary condition and the tubercular adnexitis was secondary.

Now, as to the question of appendicitis. When an involvement of the appendix takes place and there occurs an associatde peritonitis more or less localized or more or less diffuse, we are dealing with streptococci or bacterium coli principally, in the peritoneal exudation. This exudation need not be great or extensive; it need not extend down deep into the pelvis. It may be slight and localized immediately around the appendix, yet the action of the ciliated epithelium in the tubes attracts toward the adnexa and takes up into the tube lumen these infecting bacteria. Here we have the possibility of an involvement of the peritoneal covering of the tubes, and especially the possibility of an involvement of the ovary and its Graafian follicles.

I have for a long time noted the occurrence of tubal and particularly ovarian involvements, generally affecting the right side, which occurred in patients in whom an infection from below, except of the mildest type, could be almost excluded. In addition, these involvements were not at all of a nature which suggested gonorrhea, and the tube was generally open. They developed in individuals at a period of life when the lesions could not be referred to the infectious diseases of childhood, and the history in many cases pointed distinctly to previous mild or

more serious involvements of the appendix. Thus, I came to the conclusion that the bacteria thrown out in the peritoneal exudate resulting from appendicitis produced an involvement of the uterine adnexa. This involvement naturally varies in different individuals, according to the susceptibility of the peritoneum to inflammation and to adhesions, according to the virulence of the bacteria, and the resistance of the patient and other factors which we are at present unable to distinctly determine.

It might be expected that evidences would be present in the genito-urinary tract which would definitely indicate, in all cases, the point from which the infection started; but we know that, especially in subacute and chronic cases, evidences in the cervix and uterus may be almost wanting and the point of origin of the infection is therefore doubtful. The history of previous attacks does not always give a definite picture pointing clearly either to appendicitis or to infection of the adnexa from below. Appendicitis may cause such a pelvic peritonitis as to involve both tubes and ovaries very markedly. Omentum may be adherent to uterus and adnexa. Both tubes and ovaries are bound down by thin cobweb adhesions. Both ovaries are cystic, and the right one especially may contain one very large, single cyst. The right side is more involved in structure and by adhesions than is the left. In such cases the appendix is of course very markedly involved, and in one of my cases was spontaneously amputated from the cecum and connected with it by adhesions only.

Primary involvement of the appendix of a slight degree may affect especially the right adnexa. The associated peritonitis produces a pelvic peritonitis; the right tube is often closed and adherent, and the right ovary is enlarged and cystic and often contains one large Graafian follicle cyst.

(1) Appendicitis in the form of an inflammation of the mucous membrane does not result from inflammatory diseases originating in the uterus or adnexa. (2) Involvement of the appendix viewed as a peritoneally covered organ may take place as part of a peritonitis more or less localized, or more or less extensive, which has its origin in inflammatory diseases of the adnexa.

(3) Severe inflammations of the appendix, in so far as they cause a pelvic peritonitis, or in so far as the accumulation of pus is located in the pelvis, naturally involve the uterus and adnexa in adhesions, and do not cause pyosalpinx, but may cause tubo-ovarian cysts. (4) A differential diagnosis as to original site of the infection is often impossible, except from the operative clinical standpoint, and even then is not always certain. (5) Mild attacks of appendicitis without the production of well-defined peritonitis may involve the adnexa without adhesions, but especially by infection of the Graafian follicles, alterations of the ovarian stroma, and the production of varicocele of the broad ligament.

Varicocele.—There is often noted in one or the other broad ligaments a tremendous dilatation of the veins in the upper part of the broad ligament and near the hilus of the ovary. This condition is like that in the male known as varicocele. Many cases of unilateral or bilateral pain often diagnosed as salpingo-oöphoritis show on operation this alteration in the upper border of the broad ligament. This is often considered to be the result of the displacement of the uterus and interference with the circulation of blood to and from the uterus. It cannot be denied that this condition is often found in retroflexion; however, it is by no means infrequent where the uterus is normally placed. Varicocele is often found in the utero-vaginal plexus and uterovesical just as in the pampiniform and is characterized by decided varicose dilatation of the veins. Through the slight development of valves changeable degrees of dilatation are produced by sexual excitement, menstruation, position of the uterus, subinvolution, etc., which may cause many backaches heretofore not explained. In some cases there may result a varicocele, in the region of the trigone. While it cannot be denied that circulatory causes may be responsible, yet I have found the condition so often combined with pathologic changes in the tubes and ovaries that it constitutes in many instances a para-oöphoritis, that is, a parametritis involving the upper part of the broad ligament, and more particularly the area situated near the ovary, and also the ligamentum infundibulopelvicum. While the cause of this

condition is most frequently an infection extending from the cervix or uterus after labor, abortion, or curettage, yet a primary involvement of the peritoneum may also be the cause. In these cases the pain usually subsides when the patient goes to bed.

Oöphoritis.—Pain in the right or left side, especially on the right side, is frequently due to structural changes of the ovarian tissue without the presence of adhesions or closure of the tubes. With this is very frequently associated a varicose condition of one or both broad ligaments or a shortening of one or both ligamenta infundibulopelvica. Varicose veins of the broad ligament may be due to thrombotic or other changes subsequent to curettage, or to mild and often unrecognized infections extending into the parametrium from cervix or uterus, especially after labor or abortion. These may be responsible, through circulatory and interstitial disturbances, for changes in the structure of the ovary and for the production of small cystic degeneration, or cirrhosis. It is certain that appendicitis, too, may cause such a change in the broad ligament and may produce inflammatory changes in the ovary. These are often found on the right side combined with the special symptomatology of ovarian involvement and with a shortened ligamentum infundibulopelvicum. This pathologic involvement of the ovary and broad ligament of the right side is often noted at operation to be associated with involvement of the appendix and the mesoappendix.

As a result of any of the above causes the ovary may be altered in size and contain cysts. The tunica albuginea may be thickened and the stroma may be indurated, so that the term "cirrhotic ovary" seems justified occasionally. *The characteristics of this ovarian involvement are not modified greatly by the symptoms of the involvement of the appendix.* So far as the ovary is concerned, there is a steady, gnawing, burning pain, which often *radiates into the thigh or extends upward toward the ribs or which may be felt in the iliac bone.* The pain is more noticeable after walking or on exertion, and is therefore most marked at night. During the week preceding menstruation it increases in intensity, and on the establishment of menstrua-

tion it may lessen or it may continue. A reflex annoyance is *nausea*, which may be felt before, during, or after menstruation, and which is sometimes very marked. The pain felt in the ovarian region may at some menstrual periods be marked, at other periods less severe. The reason for these symptoms can be readily understood. We are dealing with an ovary, altered in structure, and with a varicose broad ligament. Menstrual congestion produces hyperemia in these tissues, and pain is therefore increased during the premenstrual period. If a follicle ripens in the involved ovary, the pain is more severe. If the tunica is thickened, the rupture of the follicle is prevented and the follicle increases in size. Rupture of the follicle relieves the pain. Bimanual examination at an intermenstrual period may show nothing palpably except a sensitive ovary. It may, if frequently repeated, show the period of greatest pain to be associated with the presence of an enlarged ovary and an unruptured follicle. Women with these alterations may suffer for months and years with this almost constant but not always severe pain, which eventually has a harmful and injurious effect on their physical and nervous state. Even though this ovarian pain is most frequent in women with an asthenic nervous system, and even though the pain is caused by the functional congestion of menstruation and by ovulation, nevertheless it is this function, carried out in an ovary altered even though slightly as to its stroma and tunica, which causes the local annoyance. Often enough there is associated a uterine displacement or enteroptosis or ren mobilis which is considered the cause of the pelvic disturbance. When these patients are finally reduced to a state of nervous and physical asthenia, the diagnosis varies from appendicitis, movable kidney, nephrolithiasis, to neurasthenia and hysteria. A close study of the history of the case, of its development, and of its course, shows the annoying symptoms to be related to the functional activity of the ovary. Sometimes these cases are correctly classed under ovarian dysmenorrhea. More often the appendix is removed through a small incision, or an Alexander-Adams operation is done, or a movable kidney is fixed, and, naturally enough, the symptoms continue. It is certain that a neurasthenic predisposition

renders patients more sensitive to pain, and that alterations in the ovary need not be marked to produce the symptoms mentioned above. On the other hand, the long duration of pain is sure to increase the neurasthenic predisposition and may bring on a state of semi-invalidism.

The differential diagnosis between such a chronic oöphoritis and salpingo-oöphoritis cannot always be made. There is a disease of the ovary, called ovarian neuralgia, in which the pain comes on suddenly, lasts for a few hours or a day, and ceases suddenly at the menstrual period. This is considered by some to be an ovarian neuralgia, while by others it is considered to be simply the result of an oöphoritis of the form just described.

Right-sided Pain.—The source of prolonged right-sided pain from which women suffer is not always easy to diagnose. In fact, the differential diagnosis between an involvement of the appendix and involvement of the ovary is often extremely difficult. Very frequently both conditions are present. If a previous severe, sharp attack of appendicitis has produced peritoneal involvement around the tube and ovary of the right side, these structures are bound down by adhesions, but pus is not found in the tubes. It is not necessary that the appendix be attached closely to the tube and ovary, but usually in these cases there are thin adhesions around the appendix or the appendix is subcecal. The meso-appendix is shrunken. Bimanual examination divulges a sensitive adherent tube and ovary, and only the history in many cases suggests of the diagnosis of a causal appendicitis.

Pregnancy.—In pregnancy pain is a frequent symptom, localized in one side or the other, and due perhaps to some inflammatory involvement of the tube and ovary. On the other hand, there are pains that are localized in the uterus, in which the fault is probably to be sought in an inflammatory involvement of the endometrium. In pregnancy, too, a pyelitis must be excluded. This latter condition is extremely common.

The pain in abortion in many cases is characterized by a sense of fullness and weight in the pelvis like that associated with menstruation, but more intense. The pains of labor are

simulated, however, in some cases when the uterus contracts actively and the cervix dilates. In the expulsion of the ovum in whole or in part, or when large pieces or clots are being expelled, there is, of course, the associated bleedings which, with a history and bimanual examination, make the diagnosis.

Backache.—The most frequent causes of continued backache are an overloaded sigmoid tugging on its mesentery, chronic pyelitis, flat feet, focal infections, pelvic congestion, adnexal disease, and parametritis posterior. The latter represents an involvement of the lymphatics of the uterosacral ligaments or the posterior parametrium by a previous cervical infection or by a chronic cervical catarrh. Infiltration of lymphatic connective tissue around the rectum is an added cause. The presence of rectal ulcerations is to be excluded. Involvement of the coccyx is another factor. It is important in backache to see if bimanual examination or manipulation will reproduce this pain or cause the sensation of stretching and discomfort in the rectum of which the patient complains. The simplest manipulation is to insert the fingers into the posterior fornix and lift the cervix up toward the symphysis. This puts the uterosacral ligaments and posterior parametrium on the stretch, and if it is productive of the same pain as that of which the patient complains, the diagnosis is made. A large subinvoluted uterus associated with pelvic congestion is often productive of backache, but, as a rule, the patients who suffer the greatest annoyance are those in whom there has been chronic inflammation of the cervix or uterus, with deep laceration of the cervix and with chronic inflammation of the cellular connective tissue. In many patients backache is due to toxemia or a gouty diathesis.

Gastro-enteroptosis associated with movable kidney and often with hysteroptosis is responsible for the indefinite, irregular, and changeable site of the pain felt by many women. This splanchnoptosis is often present in women who have borne several children. There is a loss of the normal tonicity of the general elastic structures of the body and of the abdominal wall. Errors of digestion and general nervous symptoms are present. The pelvic congestion associated with the enteroptosis,

and particularly the hysteroptosis, produces a sensation of weakness in the back, a sensation of dragging, and in some cases a steady dull discomfort described as a pain. In this connection it must be stated that retroversion and retroflexion are considered to be a cause of backache and of pelvic discomfort. In the vast majority of cases of retroversion and retroflexion with which pain is associated, the discomfort is really due to inflammatory conditions in the uterus, or to pelvic parametritis or to unrecognized ovarian involvement. Salpingo-oöphoritis in many cases is a lesion which cannot be readily made out by bimanual examination, and when associated with retroversion or retroflexion this displacement of the uterus is often considered to be the cause of the annoyances.

Pain accompanying a regular menstrual period, and developing at the time that menstruation began or later, is known as dysmenorrhea. Dysmenorrhea, when acquired, is usually of an inflammatory nature. It may be due to processes occurring in the uterus near the internal os, or in the lining or wall of the uterus, or in the tubes or peritoneum or ovary. When such infiltrated, inflamed tissues are stretched by the congestion of menstruation, sensitiveness and pain are naturally excited.

Bone Changes and the Internal Secretions.—The ovaries are related to the thyroid, the thymus, the adrenals, the pancreas, and the hypophysis. The thyroid, the chromaffine (adrenal) system, and the hypophysis stimulate bone growth. The pancreas and parathyroids retard the same. Bone changes may be influenced by the thyroid, as is seen in myxedema. Diminished thyroid secretion or removal of the thyroid interferes with the union of fractures, causes a stationary state of growth, a diminished calcification of the dentin. In hypothyroidism there may be, however, a decided development of the skull. If the thymus is removed there is inhibition of bony growth and some atrophy of the ovaries. After removing the thymus there occur osteomalacic and osteoporotic processes, the entire organism lacks calcium, and there is subnormal development of the skeleton; fractures heal poorly. The thymus is the important organ of the nuclein synthesis. When

the thymus is no longer present, other substances dissolve the calcium salts or hold them in solution. When the thymus is removed the peripheral nervous system is excited, which excitement is diminished by hypodermic injections of calcium lactate. Early castration may influence the bony pelvis, resulting in the continuation of its infantile form or the development of the male type. Certain diseases of the hypophysis show its relations to the thyroid. The adrenals, by increasing blood-pressure, produce enlargement of the bone-marrow spaces. After removal of the adrenals excretion of phosphorus is increased. The pancreas acts like the parathyroids and has an opposite rôle to the thyroid. In pregnancy the hands and feet become larger, the face wider, the features plump, etc. This may be partly due to fat or to slight edematous swelling, yet at this time there is increased growth of bone, so that an individual becomes more robust. These conditions simulate acromegaly, and are probably the result of hyperfunction of the hypophysis. Kolisko calls attention to a great increase in weight after eclampsia, due to a sclerosis of the bones of the pelvis, the cause of which is not clear. Some speak of a physiologic osteomalacia of pregnancy. Too frequent labors may result in rhachitis in the later children if they are being nursed by the again pregnant mother. The placental secretion seems to cause an increased blood-pressure. Hypertrophy of the thyroid occurs during pregnancy. The same change occurs in the adrenals, which show characteristic alterations; the same thing happens with the hypophysis, especially the anterior lobe. There is an increase of the chromaffine cell elements of the hypophysis and the Haupt cells form the so-called pregnancy cells. After disappearance of the sexual function in women there may develop, aside from senile osteomalacia, Heberden osteophytes, and other atrophic or hypertrophic bone affections, occasionally inflammatory bone affections, as well as alterations against which thyroid and not ovarin seem to have a good influence.

Osteomalacia and Pain.—This condition of softening of the bones accompanied by pelvic pain affects the female more often than the male sex. As regards the beginning of this condition and its recurrence certain phases, such as puberty,

are of importance, as a result of the hyperemia of bone tissue which occurs at this time, but more especially during pregnancy. The typical ovarian form, which affects the pelvis, is to be contrasted with the type which involves the extremities. Fehling maintains that the ovaries produce trophic disturbances in the bones, an angioneurosis with evidences of hyperemia, and increased CO_2 content. The changes in the bones and the annoyances in osteomalacia increase during menstruation, while castration often produces a marvelous improvement. There is increased fertility in these patients. There are various rheumatic pains at the time of menstruation and increased annoyances during pregnancy and in the puerperium. In some cases there are fibrillary muscle contractions and intention tremor. There may be neuralgias of the pelvic nerves and of the foot nerves. There may be marantic symptoms, disturbances in walking, inability to work, development of edema, decubitus ulcers, sleeplessness, and psychic depression. The most frequent locations for the bony disturbances are in the vertebræ, the lower extremities, and the pelvis. The symptoms may be mistaken for myositis, paralysis of muscles, polyneuritis, chronic myelitis, irritatio spinalis, and also functional disturbances, such as neurasthenia and hysteria. There may occur a combination of osteomalacia with affections of the thyroid, such as morbus Basedowi. The complications of osteomalacia are marasmus præcox, diabetes, and tuberculosis of the lungs. Useful drugs are calcium and iron, bone-marrow, in the form of a glycerin extract, thyroid, ovarin, especially ovarian antibodies, such as the serum of castrated animals. Some use adrenalin. Castration does more good than anything else.

There is a tendency to recurrences of joint affections of a gonorrheal nature during pregnancy. Pregnancy in the last month makes this condition worse and latent infections become more virulent.

Disturbances of the pelvic nerves, such as "pelvic neuralgia," may be due to very different causes, such as rheumatism, osteomalacia, lues, tuberculosis of the ileosacral and symphysis areas, masses of callus, and bony tumors.

TREATMENT OF PELVIC PAIN

In the acute inflammatory stages absolute rest in bed, cold applications to the abdomen, or the cold coil are indicated. When peritoneal irritation is present, the ice-bag should be used, but the patient should not be annoyed by its weight. The bowels should be kept open. With hyperpyrexia sponge-baths or cold rectal irrigations are of value. Vaginal cleansing douches are of value to remove excessive secretion, and should be given at a temperature of 70° to 80° F., but with low pressure.

The vast majority of the cases can be carried through the acute stages by conservative treatment. If conservative treatment is continued for a reasonable period of time without improvement, other curative means may be considered. When high fever and marked peritoneal irritation complicate a pus sac with thin wall or an abscess of the ovary, operation is necessary. If observation of the temperature, careful repeated bimanual examination, and a persistent leukocytosis over 15,000, show continuation of a constantly enlarging pus focus, and increasing peritoneal irritation and pain, there is probably a purulent accumulation which demands vaginal incision and drainage.

If, however, on the use of conservative treatment fever decreases and pain diminishes, cold applications are replaced by stimulating applications to the abdomen, and subsequently by the administration of long sitz-baths at 95° F. Any return of pyrexia demands the treatment applicable in the acute stage.

Great benefit and improvement are obtained by rest in bed for long periods of time. The associated congestion and edema of the broad ligaments diminish, and eventually there results a marked resorption of the inflammatory exudate, leaving the adnexa in such a state that if operation is necessary, we find adhesions of the peritoneum, with alterations in the tubes and ovaries, but with relatively normal ligaments as regards infiltration. If the process results in pyosalpinx, conservative treatment carried over a long period of time, supplemented by the use of warm abdominal applications, is often followed by a thickening of the pus. In fact, the contents of the pyosalpinx frequently become sterile after such treatment. Many cases

have been treated in this manner, particularly after labor or abortion, and subsequent operation, becoming necessary because of pain, has shown a surprisingly slight purulent involvement of the tubes and peritoneum.

In the treatment of chronic adnexal diseases much heat should not be used so long as fever continues. Later, stimulating abdominal applications are useful, warm douches with small amounts of water should be given, and warm sitz-baths of ten minutes' duration may be taken. If fever has not recurred and no pus sacs are present, long, profuse, hot vaginal douches and warm abdominal compresses should be used. Warm prolonged sitz-baths and full baths are of value.

In chronic cases without fever, where pus accumulations are absent, the treatment should be supplemented by regular thorough packing of the vault of the vagina with gauze soaked in glycerin. This method, plus massage, may cause pain to disappear and menstruation to become regular. This is brought about through the increased blood-supply furnished to the uterus and tubes, as a result of which the inflammatory products may be absorbed. Pregnancy may follow. The use of the Nauheim baths and of sitz-baths is of value in the chronic stage and recurrence of attacks is often prevented by their use. In many cases of gonorrheal origin, improvement is slow, for the original condition remains unchanged, through either the virulence of the gonococci or the susceptibility of the patient.

The same methods of after-treatment apply to those cases which have been incised vaginally.

The treatment of the cervical conditions is given in the section on Cervical Catarrh or Endocervicitis, and implies the use of vaginal pressure therapy and the use of appropriate douches, sitz-baths, and abdominal applications.

Subacute or chronic inflammations not associated with pus constitute a goodly portion of the cases coming for office treatment. It is necessary to take into consideration the associated vulvitis, vaginitis, cervicitis, parametritis, and endometritis, if any or all of these be present. It is in those cases in which there has been peritoneal involvement that intrauterine therapy is harmful. Hence treatment is limited

to what can be accomplished through the vagina. The vagina is, of course, at each visit thoroughly cleansed. Erosions, if present, are treated by carbolic acid and iodin, and later on by silver nitrate, as mentioned in the section on Cervical Catarrh. The vault of the vagina should be thoroughly painted two or three times a week with tincture of iodin. Boroglycerin or ichthyol-glycerin should be poured into the speculum and the posterior fornix and the upper part of the vagina should be gently but firmly packed with gauze. We accomplish thereby pressure of a gentle sort, a mild stretching of adhesions, and favorable alterations in the pelvic congestion, added to which is the influence of dehydration on the uterus and cervix. After such vaginal packings the patient should go home and remain quiet.

On removing the vaginal packing twenty-four hours later the patient should take a hot vaginal douche, after which she should lie down for a one hour. During the menstrual periods patients must avoid physical exertion, for during this time recrudescences of inflammatory processes may occur. In the course of time it is possible to relieve many of these patients with retrodisplacements of their annoyances, and prolonged hot vaginal douches, followed by massage by the bimanual method, may bring a fixed uterus back into normal position, so that in some instances a pessary may be worn with comfort. The degree of annoyance does not depend entirely on the amount of infiltration or the extent of adhesions, but also on the individual sensitiveness of the patient. In some cases slight changes cause marked pain, while in others marked alterations cause relatively little annoyance.

In many cases the Nauheim baths have a remarkable resorptive influence on pelvic inflammations in the afebrile period and a very beneficial effect on congestions and those infiltrations in the pelvic cellular connective tissues which are productive of so much pain and backache.

Retroflexions and versions, especially if associated with descent of the uterus, with non-elastic ligaments and pelvic congestion, demand preliminary treatment by intravaginal pressure therapy, followed by the introduction of an appropriate

pessary. The support given to the pelvic organs often quickly relieves the sense of weight and backache. (See p. 130.) Splanchnoptosis and loose abdominal walls are relieved by appropriate abdominal supports or by the use of Rose's bandage. (See pp. 143–145.) Constipation must be overcome and permanently cured by hydrotherapy, massage, exercises, proper food, etc. (See Constipation.)

Backache may be due to hysteroptosis not accompanied by a retrodeviation. Here we often note marked pelvic congestion. The use of a pessary to hold the cervix high up and far back, the use of an abdominal support, the use of the sinusoidal current are often of very decided benefit.

Pain may be temporarily relieved by the same drugs as are used for the relief of dysmenorrhea. (See p. 317.) The value of abdominal applications, of douches, of sitz-baths, of counter-irritation, and of electricity for the relief of ovarian pain can be noted by a reference to the sections which deal with these therapeutic procedures.

In many cases no form of treatment relieves the pain, which, if long continued, produces sleeplessness, loss of weight, digestive disturbances, and a definite loss of nervous tone and neurasthenia. Only operation brings relief. Aside from conditions associated with adhesions, it is the ovary, and its surrounding area of broad ligament, including the ligamentum infundibulopelvicum, which is responsible for the greatest suffering. Lesions which often escape bimanual detection may cause more pain than gross palpable involvements. We should guard against the danger of minimizing the degree of suffering complained of and against the danger of attributing pain to hysteria, neurasthenia, and imagination. We should also refuse to correct displacements surgically for the relief of pain which resists the various forms of treatment without making an exploratory laparotomy. Hence when such uterine displacements are present, an intraperitoneal operation should always be selected. No more grateful patients can be found than those relieved of pain by non-operative methods. Pain is the indication which calls for operative interference when other methods fail. Conservative opera-

tions, operations which preserve part of an ovary or part of a tube, when pain is due to these structures and their involvements, are poor surgery. In the vast majority of cases operated on because of pain, preservation of menstruation or attempts to conserve the tubes for the purposes of fecundation are of secondary import and should not interfere with the radical cure of the primary indication. In right-sided pain particularly we should not be content with removal of the appendix, but should remove the right adnexa entirely if the symptomatology points to tubal or ovarian involvement, as is the case in the vast majority of women in whom appendicitis is diagnosed as the cause of the steady, continued pelvic pain in the right side, increased during menstruation. The macroscopic appearance of the tubes and ovaries is no sure guide to the degree of pain subjectively felt by the patient. If we paid less attention to the operative correction of versions and flexions, less to the supposed need for curettage and to the repair of lacerated cervices and perinea for the correction of pelvic pain, and directed our medical and surgical attention to the cellular connective tissue, to the peritoneum, to the tubes and ovaries, we should be doing our patients greater justice.

STERILITY

After the menstrual function is established, mature ova are supposedly extruded at regular intervals from the surface of the ovary. As a Graafian follicle gradually approaches the surface of the ovary, the peripheral area becomes continually thinner, until finally the tension produced by the liquor folliculi causes bursting of the follicle, and the ovum leaves its bed and is thrown out into the peritoneal cavity. Here it lies in the peritoneal plasma, awaiting entrance into one or other of the Fallopian tubes. The Fallopian tubes are lined with ciliated epithelium and the outer end of each Fallopian tube is large and lined with folds, which makes the area covered by ciliated epithelium quite extensive. The cilia produce a current which draws the ovum in the peritoneal plasma into the tube. The current created by the ciliated epithelium of either tube is so marked that if one tube is absent or closed, or if the cilia do not functionate, an ovum from an ovary of the affected side may be drawn up into the opposite tube, the cilia of which create a current sufficient to direct and draw the ovum into the tubal lumen, and to carry the ovum on into the uterus.

When active spermatozoa are deposited in the vagina, they pass up by their own motility, through the cervix and uterus, and out through the tube against the current created by the ciliated epithelium. The usual meeting-place for spermatozoa and ovum is at the outer end of the tube, though this meeting may take place within the peritoneal cavity, or in the uterus.

Fecundation and pregnancy imply the union of healthy active spermatozoa with a ripe healthy ovum and the passage of this ovum through the tube. Sterility may be due to the absence of one or both of these essential primary factors or to obstacles which prevent their union or to obstruction to the passage of the fecundated ovum through the tube.

CAUSES

Amenorrhea.—Primary amenorrhea may imply an absence or abnormality of the genitalia or an underdevelopment of uterus or ovaries. A hypoplasia may be primarily uterine or may be secondarily produced by failure of development or of function on the part of the ovaries.

Amenorrhea may be due to adhesion of hymen or to atresia of the vagina or cervix. It is also associated with obesity, in which case the amenorrhea is either absolute or relative.

Secondary amenorrhea may be temporary or permanent. It depends on blood states, on atrophy of the ovaries as a result of infectious diseases, diabetes, and occasionally the abuse of opium; it may be due to derangements of the ductless glands; it is often associated with increasing obesity. Amenorrhea frequently exists simply as a precocious menopause, or is due to lactation atrophy or to atrophy of the uterus produced by too energetic use of the curet or of atmocausis. Amenorrhea of itself, however, does not necessarily preclude the possibility of pregnancy taking place. Ovulation may take place without menstruation, but menstruation does not occur without ovulation.

Spermatozoa.—When normally developed genitalia are present in the female, it is imperative that the existence and presence of active, healthy spermatozoa in the husband be determined before subjecting a woman to office or operative treatment for the cure of sterility. Therefore the examination of the seminal secretion is essential. It may be found that no spermatozoa are present, or inactive spermatozoa may be found, in which case the fault may justly be attributed to the husband. On the other hand they may be present in proper number and in a proper state of activity. Examination of the prostatic seminal secretion is valuable, for large numbers of pus cells, bacteria, and cocci, may furnish evidence of the cause of sterility. If pus cells are present and at the same time normal spermatozoa are found, we must often regard the pus cells as the reason for the sterility, through the inflammatory processes which may have been set up in the female genital tract. Granted, then, that normal spermatozoa are present, the next point is to deter-

mine the existence of normal ova, unless gross pathologic lesions closing both tubes are found.

Ova.—In a woman who menstruates normally and in whom the uterus and tubes and ovaries seem properly developed, it must be taken for granted that ripe ova are given off at regular intervals. There are cases of properly developed ovaries which produce a normal congestion, but associated therewith is an underdeveloped small uterus. There are other cases with normally developed uterus in which the ovaries are small and fail to produce a normal congestion. In obese patients there is often found a small uterus and the menstrual process is such that insufficient ovarian action must be presumed. Such patients are either primarily obese, and have evidenced this condition of the uterus and ovaries from adolescence, or the obesity and the associated atrophic uterus and diminished ovarian activity are acquired at a subsequent period. There are cases in which Graafian follicles partially develop, but never to the full extent. Often they do not rupture, but form the so-called atresic follicles. In such conditions we are apt to find various degrees of actual or relative amenorrhea and various degrees of hypoplasia, under-development, or atrophy of the uterus. It is of importance to determine these facts.

Hypoplasia.—Hypoplasia of the uterus is a frequent cause of sterility. The blame does not rest upon the ovaries if menstruation is of normal duration and the congestion from the ovaries is of normal degree. If a uterus is concentrically or excentrically smaller than normal and the molimina are slight or irregular, the absence of ripe ova, or the existence of tubes which cannot carry the ovum into the uterus, is probable. At the same time, the uterus itself does not favor the reception of an ovum, or its embedding if it does enter the uterine cavity, because of the character of the endometrium and its failure to develop a normal decidua periodically.

Obstruction to Progress of Spermatozoa.—If normal spermatozoa are found to be present, and if the uterus is of normal size and apparently normal tubes and ovaries are palpated, and if menstruation follows a normal course, sterility is due either to failure of the spermatozoa to unite with the ovum or to

inability on the part of the ovum when fecundated to be drawn into the uterine cavity. Failure of the spermatozoa to unite with the ovum implies an obstruction or obstacle somewhere between the vagina and the outer end of the Fallopian tube. The Rubin test will frequently demonstrate that the tubes are not patent, even though no enlargement or thickening of their walls can be discovered by palpation (see page 53). There are cases in which the character of the vaginal secretion is such that the spermatozoa are injured and their activity is destroyed.

Cervix.—The cervix supposedly frequently furnishes a point of mechanical obstruction to the upward progress of the male element. Stenosis of the external os, a long narrow cervix, stenosis of the internal os, or a hypersecretion or a profuse pathologic cervical secretion are considered the elements which impede the upward movement of the spermatic cells. However, in innumerable women with extremely narrow or pin-hole external os pregnancy takes place.

It is not unreasonable to attribute to the internal os a rôle of importance in the etiology of sterility. Here there may be a congenital or acquired actual or relative stenosis due to overgrowth of the cervico-uterine lining. It may be possible for a sound to enter the uterine cavity easily, and yet so excessive may be the amount of overgrowth of the mucous membrane that an obstacle to the passage of spermatozoa actually exists. There are cases where the normal mucous secretion of the cervix is excessive, and yet the spermatozoa pass upward. If, however, the cervical secretion is pathologic as the result of an inflammation or infection, there is perhaps more reason to consider its irritating presence a factor in the production of sterility through injury to the spermatozoa. These latter conditions existing in the cervix, together with an acute anteflexion causing an obstruction at the internal os, are generally deemed extremely important factors in the etiology of sterility. Some of these patients do finally become pregnant after the cure of the hypersecretion or the cervical catarrh, by dilatation of the cervix, or curettage of the overgrown cervico-uterine mucous membrane, or surgical treatment of the anteflexion,

etc., yet the number of such cases of sterility cured by these procedures is relatively small and the cervix is not an all-important factor.

Endometrium.—On the other hand, an endometrium which has been the seat of chronic inflammation may become so atrophic and its decidual reaction may be so altered as to not admit of embedding on the part of the fecundated ovum. If there is a hypertrophic overgrown endometrium, we may find in this condition an explanation for certain cases of sterility, because the changes which go on in the embedding of the ovum are such that the ovum is cast off very shortly after it becomes attached. This etiology, however, is more frequently productive of early abortions than of absolute sterility. It is possible that the hypertrophic endometrium may obstruct the openings of the tubes into the uterine cavity, but this occurrence is not a frequent one.

If an inflammatory endometritis associated with profuse acrid discharge is present, it is possible that this discharge antagonizes the on-coming spermatozoa, prevents them from uniting with the ovum, or destroys their activity. Fibroids of the uterus may so alter the shape of the uterine cavity as to form a mechanical obstruction to the upward progress of the spermatozoa. If so, they must be very large. The number of instances in which pregnancy occurs in the presence of fibromata show that this obstruction, to be effectual, must be mechanically absolute. The menorrhagia or metrorrhagia associated with fibroids may sweep out the spermatozoa as they ascend, or carry out the ovum as it enters the uterine cavity, or arise from an endometrium which is not well adapted to the embedding of an ovum.

Tubes.—An inflammation in the tubes, so long as it does not obliterate the lumen of the mucosa or does not cause a mechanical obstruction by adhesions or by the presence of much purulent accumulation, is not necessarily an obstacle to the progress of the spermatozoa, for they pass out to the abdominal end by their own movements against the current created by the ciliated epithelium. A frequent cause of failure of union between the ovum and spermatozoa, however, is the closing of the outer end of the Fallopian tubes by peritoneal adhesions.

In such cases the spermatozoa cannot pass out into the peritoneal cavity and the ovum cannot enter the Fallopian tube. In some cases peritubal inflammation causes twists, bends, and constrictions of the tubal lumen.

The patency of the tubes can easily be determined by the transuterine insufflation of oxygen or carbon dioxid gas (Rubin Test). See page 53.

Ovary.—When the ovaries are embedded in adhesions or surrounded by mild cobweb adhesions, the ovum cannot escape from the ruptured Graaffian follicle, and enter the peritoneal cavity. This, of course, is an absolute cause of sterility. In other cases the exit of the ovum from the ovary is not prevented, but adhesions at the abdominal end of the tubes obstruct the union of spermatozoa and ovum and prevent the ovum from being attracted into the Fallopian tube.

Obstruction to Progress of Ovum by Salpingitis.—Perhaps the most frequent cause of sterility is a mild salpingitis. The ovum and the spermatozoa are able to unite within the peritoneal cavity, but the fecundated ovum cannot enter the uterus. In these cases there are no adhesions around the abdominal ends of the tubes, but the tubes are the seat of a salpingitis of varying degrees. With a salpingitis of even mild character, and especially so if there is a catarrhal salpingitis, the ciliated epithelium of the Fallopian tubes may not functionate. Without action on the part of the ciliated epithelium a fecundated ovum can enter neither the tube nor the uterus. This is an extremely frequent cause of sterility, and in some instances can be corrected or cured when, in the course of time, the salpingitis has subsided and the ciliated epithelium is restored to the normal. Strange to say, in the early stages of gonorrheal salpingitis with purulent accumulation pregnancy may take place in the uterus in some instances and in other cases in the tubes.

The Cilia and Sterility.—I have always felt that derangements of the internal secretions had much to do with sterility. To my mind a normal functionating ovary evidences itself by a certain, supposedly normal, amount of menstruation. With this as an accepted standard, and with the added manifestation of a certain degree of premenstrual molimina, we

have a right to assume the existence of follicles which produce ripe ova. The fact that some women who conceive menstruate only every two or three months, and that several cases have come under my observation of women who have borne children and have not menstruated for intervals of one to two years (not because of lactation), does not nullify the general principles just enunciated, for they are only clinical points that guide us in forming an opinion. Hence, with relative amenorrhea, or with actual amenorrhea, or with the amenorrhea associated with obesity, it is not unreasonable to presuppose that the ova are at fault, either in not being what may be termed "ripe," or through being retained in atresic unbroken follicles. In this type of case, and also in the ones characterized by the various degrees of genital hypoplasia, other factors may be of importance. The tubes may be very small, they may be tortuous, and, what is most important, the cilia may be involved. On the activity of the cilia of the epithelium of the tube depends the entrance of the ovum into the uterus. It is a natural supposition that the ovaries, through their trophic effect on the uterus, may be also the factors which activate the cilia. If we observe absence of spermatozoa or inactive spermatozoa in the male, why may we not have inactive cilia in the Fallopian tubes? So that, with abnormalities in the ovarian secretion or in diseases involving the thyroid or hypophysis, it is only a rational opinion, and not a reckless conjecture, to point toward the possibility of inaction on the part of the cilia as a possible cause of sterility, and to hold the ovary or some of the other internal secretions responsible.

Congenital Causes.—The causes of sterility in the female are either congenital or acquired. The congenital cases are those in which there are ovaries which do not produce ripe ova, tubes which are under-developed and which do not transmit the ovum, or a uterus which is hypoplastic and does not furnish a normal endometrium for the embedding of the ovum, or a cervix stenosed at the internal os, with a very acute anteflexion of the fundus, or a congenitally narrow cervix.

Acquired Causes.—The acquired causes of sterility in the female are in the vast majority of instances due to inflammation

and infection. The diseases of childhood may produce necrotic or hemorrhagic involvement of the cervix, uterus, tubes or ovaries. This may result in stenosis of the cervix or in hypoplasia of the uterus or in hypoplasia of the tubes or in hypoplastic ovaries. The other inflammatory causes are infections by the ordinary pyogenic bacteria or by the gonococcus. These infections may produce an acrid discharge in the vagina and cervix or a hypersecretion of a pathologic character. They may cause a profuse discharge from the uterus, or they may so alter the lining of the uterus as to prevent a normal decidual reaction, but the most frequent seat of location of the acquired inflammatory cause of sterility is in the Fallopian tubes. The resulting salpingitis, even in the milder forms, destroys the activity of the ciliated epithelium. In the more severe cases there is a pyosalpingitis or closure of the abdominal ends of the tubes by peritoneal adhesions, or the ovaries are enveloped in peritoneal adhesions which prevent the exit of ova, provided that the ovaries still retain their function of normal ovulation. Those causes which produce salpingitis almost surely produce temporary or permanent sterility. There are two forms of salpingitis, which are not due to upward extension of an inflammation, but are the result of tuberculosis and of appendicitis. With either of these two conditions there is a peritoneal involvement associated with the presence of tubercle bacilli, streptococci, staphylococci, or bacterium coli. These, being drawn up into the Fallopian tubes by the action of the ciliated epithelium, produce a salpingitis with a destruction of the cilia, or, more frequently, the tubes show constrictions or the tube ends are closed and the result is sterility.

The history of medicine seems to furnish instances where none of the above-mentioned causes were responsible for the sterility. Here the explanation is referred to a sort of cell incompatibility. To illustrate this condition, attention is directed to those instances where husband and wife have no children, and where after marriage to another woman and man each is favored by paternity or maternity.

Sterility is of two kinds—primary and secondary. Primary sterility means that a patient has never been pregnant. Secon-

dary sterility means that after a pregnancy (whether it end in abortion or at full term) the patient subsequently is sterile, the so-called "one-child sterility."

Primary Acquired Sterility.—Primary acquired sterility may be due to a gonorrhea which has been acute in its manifestations, but more often is due to a gonorrhea insidious in its onset but involving the tubes, and frequently causing no pain, although extending out into the peritoneum. The frequency with which cases of primary sterility are treated by dilatation of the cervix, and especially by intrauterine manipulations and curettage, accounts for the extension of the mild gonorrheal infection of the cervix or uterus into the tubes and into the peritoneum. Cases of secondary sterility are not infrequently temporary, even though many years elapse before pregnancy occurs. They remain sterile because they are not treated. In other words, nature is afforded an opportunity to overcome the inflammation in the tubes, and after months or years a partial or complete restoration of the ciliated epithelium is accomplished. In primary sterility intrauterine manipulation is often attempted. Those cases of primary sterility due to mild gonorrheal infection, especially those cases in which pain is a symptom, almost always have been curetted, and it is this curettage which is beyond doubt responsible for the permanent nature of the lesions producing the primary sterility. The resulting peritoneal involvement which closes the outer ends of the Fallopian tubes cannot be relieved by any but surgical methods.

Repeated Abortion.—A fecundated ovum shows upon its outer surface a development of cells known as trophoblast cells. It is from these trophoblast cells that the covering of the future chorionic villi and placenta are formed. The characteristic of the trophoblast cells is that by enzyme action they burrow their way into the decidua, digest the tissue in their periphery, perforate the blood-vessels, and thus receive their nutrition from the maternal circulation. These cells form the two-layered covering of the villi, the syncytium, and the cells of Langhans. The uterine lining develops into decidua by a great hypertrophy of the connective-tissue cells, accompanied by dilatation of

the vessels and congestion of the whole uterus. So delicate is the relation between the growing ovum and its trophoblast cells, on the one hand, and the decidua and the maternal blood, on the other, that the wonder is not that abortion takes place, but that it does not take place more frequently.

Abnormalities in the ovum itself may be the cause of abortion. These abnormalities consist first in a syphilitic change. It may be taken for granted that an ovum made syphilitic by the fecundating spermatozoon produces cells of an abnormal character, and the viability of the embryo is readily affected. If, then, at a very early stage, there is death of the embryo, or if the cells from which the chorionic villi and the future placenta are formed are not healthy, it is evident that the relation between ovum and decidua may be readily disturbed. The ovum becomes a foreign body, uterine contractions take place, and abortion results.

The greater number of abortions, however, result from diseases of the maternal tissues. Here syphilis of the mother may be an influence, in that the processes of placental development are carried on in abnormal decidual tissues. There may be, in addition, a failure of proper nutrition of the ovum. Endometritis implies an involvement of the uterine lining, inflammatory or non-inflammatory. An inflammatory involvement resulting in great congestion of the uterine mucosa, or resulting in atrophy of the uterine mucosa, with or without a change in the vessels, destroys the delicate balance between ovum and decidua, or fails to give opportunity for sufficient nutrition of the fetal cells. Overgrown uterine mucosa in the form of hyperplasia, accompanied as it is with tendency to hemorrhage at menstruation, and associated with dilated capillaries and vessels, tends to cause capillary hemorrhage. The growth of the trophoblast cells and the extension of the chorionic villi perforates capillaries, but if these capillaries are sclerotic or diseased, or if congestion is marked, too much blood undermines the ovum and the ovum is frequently loosened from its contact with the decidua serotina or the decidua reflexa. This is perhaps the most frequent cause of abortion, especially of repeated abortions.

Changes in the uterine wall may be responsible for abortion. A uterus which is inflamed, or which is hypertrophied as the result of subinvolution, accompanied by congestion and arteriosclerosis, is either stimulated to undue contractions in the course of pregnancy or else is prone to bleed. Every uterus, whether pregnant or not, undergoes normal painless contractions, which is nature's method of keeping the uterine muscle in good condition. These painless contractions continue, and in the latter months of pregnancy are known as the Braxton-Hicks painless contractions. An inflamed or sensitive uterus reacts by unusual contraction to the presence of the growing ovum, and if of sufficiently marked character, results in hemorrhage and mechanical loosening of the ovum.

Secondary Sterility.—Secondary sterility is outside the field of congenital anomalies and is practically always due to an inflammatory cause. There are some instances, perhaps, where a resulting hypertrophic condition of the endometrium after abortion or labor may obstruct the entrance of spermatozoa into the tubes through overgrowth of the endometrium at the position of the internal ostia, but the largest number are due to recognized or unrecognized inflammations. The recognized inflammations come under the heading of post-partum or post-abortum puerperal infections, in which cases there has been an involvement in the form of a salpingitis, pyosalpinx, or peritonitis. A very large proportion of cases, especially those that are not the result of an acute septic process, are due to the gonococcus. In other words, a gonorrhea existed in the cervix or uterus before pregnancy occurred, or was acquired subsequent to impregnation. On the occurrence of abortion or labor, there takes place a mild, gradual, and often unrecognized upward extension of the inflammation, which in some instances involves the tubes alone, without the production of pain; in other instances involves, in addition, the peritoneum, with resulting peritoneal adhesions. These lesions are not necessarily so marked as to be easily recognized by bimanual examination. Many of these cases have during the post-partum period only a minimum amount of uterine discharge, and are often accompanied by only slight rises of tempera-

ture. The gonococci are found only after most careful examination.

TREATMENT

The treatment of sterility should be conservative when inflammation is evident or suspected. Treatment should be radical, so far as operations on the cervix or uterus are concerned, only when other causes can be eliminated, and when inflammation of the cervix, uterus, or other structures can be absolutely excluded. In that event dilatation of the cervix, amputation of the cervix, or curettage may be justifiable.

General Factors Influencing the Form of Treatment.—In those cases in which an acrid vaginal secretion supposedly interferes with the activity of the spermatozoa, we must distinguish those forms in which there is simply an abnormally acid condition, from those in which the vaginal condition is inflammatory. In the former it is possible that on the use of alkaline douches the acidity may be overcome. If, however, an inflammatory condition is present, it may be taken for granted that only in rare instances is this inflammation limited to the vagina alone, and for that reason the complicating inflammations existing in the area between the cervix and the peritoneum are responsible for the sterility. If we encounter a stenosed external os, with a long narrow canal, with actual or relative stenosis of the internal os, and if the existence of any inflammatory factor can be absolutely excluded we are justified in dilating the cervix. This procedure may be done slowly and gradually by the use of intrauterine electrodes and applying 6 to 10 milliamperes of the negative pole of the galvanic current, or by the introduction of very fine twists of iodoform gauze in the cervix and into the uterus, or by a more energetic dilatation shortly before and after each menstrual period, or, finally, by a surgical dilatation of the cervix, or, better yet, by a high amputation of the cervix. In a certain proportion of cases these procedures result in pregnancy, but their number is comparatively very small. This treatment of the cervix should not be attempted in the presence of any periuterine inflammation.

In examining for the cause of the sterility in 66 cases, Runge found infantile conditions in the cervix or uterus in some and in others the vagina was shallow and gaping so that fluids ran out at once and nothing was retained. Examinations of 17 controls, married women who had borne children, showed retention of spermatozoa in the genital tract, while in 34 of the 66 sterile women, under the same conditions, all the fluids escaped at once and no spermatozoa could be discovered. In treatment he aims to enlarge the posterior vaginal vault and to render the cervix more readily permeable. By packing the end of the vagina with gauze, supplemented by massage or by the use of the mercury colpeurynter, the posteror vaginal vault can be hollowed out into a pocket which will retain fluids, or a suitable pessary might accomplish the purpose. Operative measures may be needed for an extremely shallow, conical vagina with torn and gaping meatus. By raising the foot of the bed or the buttocks the upper vagina can be made to hold more fluid and its escape is prevented.

If we are dealing with a uterus in which an overgrown endometrium presumably produces very early abortions, and for that reason relative sterility, curettage is indicated, provided no inflammation exists. If, however, there is a uterine discharge, a catarrhal or gonorrheal endometritis, curettage should not be attempted, for it rarely cures the condition and it is likely to extend the inflammation to the tubes, the peritoneum, or the cellular connective tissue. The treatment of these uterine catarrhs should be conservative and intrauterine manipulation should be avoided. If, on examination, the tubes are found to be enlarged or sensitive, if the ovaries appear to be inflamed or fixed, or if peritoneal adhesions involve the tubes, ovaries, or uterus, or if a parametritis is present, we have positive evidence of the probable existence of a salpingitis with or without peritoneal adhesions. Such cases are often due to intrauterine manipulation carried out for the cure of sterility or by the performance of curettage for the cure of sterility. These conditions are a legitimate field for the practice of conservative surgery on the adnexa for the purpose of removing the obstruction to the exit of the ovum from the ovary or obstruction to

the entrance of the ovum into the tubes. But, since they are inflammatory in their etiology, they yield poor results, from the standpoint of cure. Even if the ovary be freed from adhesions, even if the outer end of the tube is opened, even if the outer end of an inflamed tube be resected, we are unable by surgical means to restore the lining of the tubes to a normal ciliated action. Hence we are compelled before or after operation to resort to those local and constitutional hygienic procedings by means of which the natural resistance of the patient is supposed to cast off the products of inflammation and restore the tubes to their normal condition. This therapy is indicated in those cases where the cervix and uterus cannot be held responsible for the sterility and where bimanual examination shows no evidence of peritoneal involvement. By conservative treatment and by avoiding intrauterine manipulation we may overcome the injury to the cilia of the tubes and may prevent the extension of the inflammatory condition to the peritoneum and ovary. Even if no evidences of tubal, ovarian, or peritoneal inflammation can be detected on bimanual examination, and even if pain is not present, sterility must be referred to a salpingitis if the uterus is normally developed, if menstruation follows the normal course, if a dilatation of the cervix has been carried out so that obstruction by the external os, by the canal, by the internal os, or by acute anteflexion has been eliminated as the causal factor. In that event we must attribute to salpingitis of so mild a character as to simply injure the action of the cilia the blame for the sterility, if active spermatozoa are present.

Reynolds believes that most cases of sterility are produced by abnormal genital secretion destructive to the spermatozoa. The vaginal secretions are normally acid and destroy pathogenic bacteria and also the spermatozoa. The effect on the spermatozoa is neutralized by the alkaline cervical secretion in coitus. Any excessive acidity kills the spermatozoa, hence a dearth of cervical secretion may be productive of sterility. On the other hand, the excessive cervical discharge due to congestion may be the cause of sterility. Abnormality of the ovaries or tubes, even when slight, causes sterility.

Moderate enlargement of the ovaries with many persistent follicles causes a perverted physiologic condition. Infantile uterus is an absolute cause of sterility. Reynolds believes that drainage of the cervix should be assured and normal mucous membrane should be supplied, and the production of normal ova should be guaranteed and venous congestion should be removed, all of which are points concerning which there can be no difference of opinion.

The treatment of sterility is divided into (1) the treatment of those cases which have never been pregnant, and (2) the treatment of those cases which have aborted or have borne one or more children. *In the former class of cases treatment is, of course, indicated only when the presence of active spermatozoa can be determined.* For this purpose coitus, with the use of a condom, should be advised as late in the morning as possible, and this condom with its contained spermatic fluid should be brought as soon as possible for microscopic examination. If fully developed active spermatozoa are present, treatment of the female may be instituted.

In cases of *hypoplastic uteri* treatment is directed to stimulation and development of this organ. The general health of the patient should be looked after, salt baths or Nauheim baths should be given, outdoor exercise advised, and hot douches, consisting of several quarts of hot water, should be taken daily. For a long period ovarin, v to x grains three to five times a day, should be administered, combined with thyroid extract gr. $\frac{1}{10}$–$\frac{1}{6}$. With relative amenorrhea, whole pituitary gr. v, or post pituitary gr. $\frac{1}{2}$–1 t. i. d. should be added. With menorrhagia, placental extract gr. v t. i. d. should be substituted. By some, the intrauterine application of electricity is lauded highly. (See pp. 157, 158.) In younger women this condition of hypoplasia often rights itself in the course of months and years, the outlook being most favorable in those cases in whom obesity, if present, diminishes, and in whom the ovaries evidence a functional capability, either by marked molimina menstrualia or by a fair amount of blood lost during the three to six days of the menstrual period. If a normally developed uterus and normally functionating ovaries are present, treatment should be

directed to preserving the energy of the spermatozoa and to aiding their upward course to meet the ovum. With an acid pathologic vaginal, cervical, or uterine secretion, alkaline and normal saline douches should be used to avoid possible injury to the activity of the spermatozoa. Aside from this process, designed to make the vaginal canal innocuous, treatment must be directed to diminishing excessive or acrid discharge from the cervix or uterus which, by its character or copious quantity, may injure or entangle the spermatozoa as they attempt to enter the uterine cavity. This purpose is best achieved by the use of the method of treatment indicated under cervical catarrh and inflammatory endometritis. It implies the use of hot vaginal douches, the use of tincture of iodin for painting the vault of the vagina, boroglycerin and gauze applied liberally about the cervix and to the vault of the vagina, and, in some cases, intrauterine irrigations are of value.

In some cases sterility seems to be due to *retroflexion*. If such be the case, the use of a Hodge or Smith pessary, corrects the trouble, provided no tubal, ovarian, or peritoneal complications are present and the uterus is replacable. In many such instances, operative interference is better adapted to the needs of the patient than wearing a pessary. Those who practise any of the intraperitoneal methods of operation, instead of the systematic use of the Alexander-Adams operation, will bear witness to the frequency with which such retroflexions are found to show inflammatory involvement of the tubes and ovaries, with peritoneal adhesions which surround the ovaries or occlude the abdominal ends of the tubes.

Very acute anteflexion, if diagnosed as the cause of sterility, may be corrected by intrauterine stem pessary or by one of the plastic operations on the cervix.

Obstruction by *stenosis of the cervix*, by a long narrow cervix, or by overgrown mucosa about the internal os demands dilatation of the cervix carried out between menstrual periods. This may be done under strictest aseptic precautions, in cases free of cervical and uterine catarrh, by gently dilating the cervix by applicators covered with cotton and dipped into 2 per cent lysol or sterile vaselin. After such treatments small wicks of

iodoform gauze are introduced into the cervical canal and left in place for twenty-four hours. Regular dilatation by sounds or by intrauterine electrodes is also of aid. I may say here that I rarely use these methods. I rely almost entirely on endocrine medication.

In the hands of some observers intrauterine stem pessaries worn for days or weeks have so removed the obstruction to the spermatozoa as to be subsequently followed by impregnation. The pessary is made of wire, so that during the period of its application access to the uterine cavity is furnished to the spermatozoa. In those cases in which, in addition to sterility, there is dysmenorrhea due to cervical obstruction or to very acute anteflexion, and in which the above-mentioned methods of treatment have failed to correct dysmenorrhea, a high amputation of the cervix at the level of the internal os is followed by cure of the dysmenorrhea and in some cases by impregnation. *On electricity*, see page 151.

In the hands of some men a certain percentage of cases of sterility have been cured by discission of the cervix and curettage. In some of these cases the result has been due to the dilatation of the cervix and to the removal of the overgrown mucosa at the level of the internal os. In other cases the results have been due to restoration of a normal endometrium, when hypersecretion from the uterus or atrophic or hypertrophic endometrium has prevented the embedding of the ovum or has resulted in its habitual early throwing off.

Many cases of primary sterility are due to *inflammatory involvements of the lining of the tube* or to inflammation which closes the outer end of the tubes. Of course, only in those conditions in which the outer end of the tube is open can we expect correction of the sterility by medical means. It is in this class of cases that curetting very often does harm, for it frequently results in the upward extension of a uterine inflammation or in the aggravation of an inflammation of the tube. This inflammatory extension often takes place after abortion and labor, and results in the so-called "one-child sterility." It certainly often occurs after the use of the curet or after intrauterine treatment. In many instances all the

other possible causes of sterility except involvement of the tubal lining can be excluded. Hence, the treatment of these cases should be conservative. Anything which improves the patient's general health will aid nature in finally overcoming the changes due to bacterial involvement and promises the best results. Local treatment should be confined to the use of vaginal douches, to the painting of the vault of the vagina with tincture of iodin, and to the use of large amounts of glycerin about the cervix, supplemented by the packing of the fornix and vagina with gauze. Work and physical exertion should be prohibited. Hydrotherapy is of great aid. Coitus should be avoided as much as possible during treatment and rest should be enjoined during menstruation. These cases, just as they are greatest in number as the cause of sterility, of course furnish the greatest number of failures. The prognosis is best in those patients who have not been curetted, who are free of pain in the region of the tubes and ovaries, and who show on repeated bimanual examination no tangible alterations of these organs.

In the treatment of *sterility in which pregnancy once existed* and was interrupted by abortion, or in the many cases of "one-child sterility," there are a few instances in which overgrown endometrium or retained decidua obstructs the internal opening of the Fallopian tubes and so prevents conception. In such instances, and in cases of hypertrophic or hyperplastic endometritis when inflammation can be absolutely excluded, curettage is indicated. However, the majority of such cases of acquired or secondary sterility are due to upward extension of a cervical or uterine inflammation which involves the tubes and ovaries in tangible or non-tangible inflammation. As a rule, they come to notice not because of the sterility, but because of the pain associated with varying degrees of oöphoritis, salpingo-oöphoritis, and pyosalpinx. The treatment of such cases is at first medical, local, and conservative, combined with the use of sitz-baths, Nauheim baths and endocrine therapy.

When all other causes can be excluded by examination and treatment, and primary or secondary sterility persists, when active spermatozoa are furnished by the male, we then come to

the consideration of intra-abdominal operative treatment for the purpose of removing those peritoneal adhesions which cause the obstruction that prevents the ovum from entering the tubes. There are, however, among such cases many in which, even after loosening adhesions or opening the tube-ends, there is still left behind an altered inflamed mucosa in the tubes which will prevent the ovum from being carried into the uterus. The results of operations done for inflammatory disease which closes both tube-ends are not very encouraging. Most favorable are those cases in which a long period of rest and freedom from intrauterine treatment has followed the inflammatory cause of the primary or secondary sterility. Still more favorable are those in which there has been no bilateral or unilateral tubo-ovarian pain. When patients have been free from pain for several years and have been treated conservatively, it may be taken for granted that the activity of the causal micro-organisms has ceased, that they have disappeared, and that the natural recuperative powers of the patient have restored the tubal lining to normal. In such cases, when the facts are put before the patient and the great possibility of failure has been explained, an abdominal operation for the removal of adhesions and obstructions and to the formation of large artificial ostia for the tubes should be advised. Corpus luteum extract in 5 to 10 grain doses before meals has proved useful in some cases of habitual abortion. Placental extract gr. v t.i.d. should also be tried. My choice of remedies for habitual abortion follows:

Hydrarg. chlorid. corrosidi	gr. $\frac{1}{100}$
Acidi arsenosi	gr. $\frac{1}{30}$
Thyroid extract	gr. $\frac{1}{10}$
Stypticin	gr. ii
Placental extract	gr. v

D. tal. caps. no. xl.

S.—One t. i. d. p. c.

FREQUENCY OF MICTURITION; DYSURIA

Among the annoyances from which gynecological patients suffer is frequency of urination, which, when marked and associated with severe contractions of the bladder, is called tenesmus vesicæ. The term dysuria is applied to the condition where urination is frequent and occurs even with little urine in the bladder, occurs also at night, and is accompanied by a sensation of discomfort and pain. Winter regards the condition in much the same way as dysmenorrhea. Hence the value of the term dysuria. There may be constant pain or discomfort in the bladder. Pain present before urination may be relieved when the bladder is emptied. Pain may be increased during urination. Pain may be felt most acutely when urination is completed.

Sixty-five per cent. of gynecological cases with bladder symptoms are due to trigonitis, which is a term applied indiscriminately to chronic cystitis, probably because the manifestations are most pronounced in the region of the trigone.

Frequency of urination may be due to congestive, inflammatory, or productive alterations in the urethra, bladder, ureter, and kidney, which involve the lining, the wall, or parenchyma, or the covering of these organs. It may also result from extravesical pressure, tugging on the bladder, and urinary stasis, caused by lesions in the other pelvic organs, such as fibroids, displacements of the uterus, cystocele, etc. The diagnosis of the cause of frequent micturition and dysuria is made by inspection, by palpation, by a study of the secretion of the urethra, by examination of the urine, by examination of the bladder with the cystoscope, and by the other diagnostic methods employed in urology.

CAUSES

Urethritis.—An acute pyogenic inflammation of the urethra in the form of urethritis, especially if the inflammation involves the vesical neck, is associated with frequency of urination,

with burning micturition, and with a purulent secretion which may ofttimes be observed only on stripping the urethra. In the chronic form there may be localized or diffuse alterations of the urethra, of its lining, and of its follicles, which conditions are productive of frequent micturition, especially if they involve the posterior area. The urethrovesical junction may be involved by an acute or chronic inflammation. This condition is often mistaken for a cystitis. Especially is this the case with gonorrheal infections of the urethra. There are, however, many cases in which the urethrocystic junction is seen by the cystoscope to be congested and hyperemic, often as a result of a previous mild infection, but without any further evidences of this cause. This is productive, in young girls and in younger women, of the condition known as irritable bladder.

In acute urethritis the external os is red and swollen. There is purulent discharge and the urethra, when examined through the vagina, is found indurated and sensitive. Pyogenic micro-organisms, usually gonococci, are present. The purulent secretion diminishes rapidly within a few days, gradually taking on a more epithelial nature, until finally in four to six weeks discharge disappears and the condition is apparently cured, though gonococci may be present for a long time thereafter. The secretion may continue for months or years, consisting mainly of epithelia. This is noted in chronic urethritis, in which condition there may be red spots about the external opening of the urethra, with involvement of the urethral glands of Skene or the periurethral glands. In other cases there is no discharge at all, but itching and burning are felt on urination. The mucosa is sensitive and instrumentation produces the same sensation which the patient feels and complains of on urination. There is then either a diffuse involvement of the urethral wall or else circumscribed alterations about the lacunæ or about the glands of Littré.

In studying urethral alterations the color and the swelling of the urethral lining should be observed and the character of the external opening and the condition of the ducts noted. Palpation of the urethra is carried out by passing the finger into the vagina. Inspection is accomplished by the urethro-

scope or Kelly endoscope. The sensitiveness of the mucosa, the presence of irregularities, and the existence of narrowing or of constrictions should be ascertained. In chronic cases the examination of the urethral secretion should be made after stripping the urethra, the massage being carried out several hours after urination. Examination of the urine in urethritis is needed only to exclude involvements of the bladder and kidney. The urine should be drawn from the bladder by catheter.

In the treatment of acute urethritis, instrumentation is contraindicated. The canal may be flushed, however, with a 5 per cent. solution of argyrol., or a 1 : 1000 solution of acriflavine, by means of a blunt-nosed urethral syringe. In chronic cases, local areas of ulceration may be touched with a 20 per cent. solution of silver nitrate, through a Kelly endoscope. A solution of 5 grains of iodin crystals in 1 ounce of mineral oil is extremely useful in chronic gonorrheal urethritis.

Tumors of Urethra.—Under tumors of the urethra Winter includes all circumscribed swellings of the mucosa present in the urethra or projecting beyond the external uterus. Prolapse of the urethra can be distinguished by the fact that the ducts of Skene are readily seen, and by the fact that by proper manipulation the mucosa which is prolapsed in its entire circumference or only on its posterior wall may be replaced within the canal. Condylomata may be present about the external opening of the urethra. There may be caruncles or polyps in the urethra. Caruncles are new formations growing out from the urethral mucosa, very red in appearance, and filled with numerous capillaries. Some of them contain so many nerve filaments that the slightest touch causes exquisite pain. These benign tumors are easily removed by the high frequency current, by the actual cautery, or by operation. There may be a diffuse carcinomatous infiltration. These various forms of growth may produce marked cramp-like pains on urination, which sometimes extend into the vulva and anus and even into the hips. Sometimes they are associated with tenesmus of the sphincter ani. Periurethral abscess and cyst require operation for their cure.

Extravesical Conditions.—Conditions outside the bladder are sometimes responsible for frequent urination and pains. A parametritic exudate may press against the bladder wall; the mucosa is arranged in thick folds in this area; the mucosa is edematous and is covered with minute vesicles—the so-called œdema bullosum of Kolischer. The same change is produced by some cases of pyosalpinx. Other diseases of the genitalia may produce annoyances in the bladder. The congestion induced by pregnancy plus the pressure of the pregnant uterus, the presence of small cervical or large uterine myomata, the existence of a retroflexion, various tumors of the adnexa, a large hematocele or a peritoneal exudate, have a congestive and pressure influence on the bladder. The bladder is involved by hyperemia in many cases of metritis, parametritis, and perimetritis. These conditions do not cause the pain noted in cystitis, but are responsible for frequent micturition. As a rule, however, there is no nocturnal frequency.

Hyperemia of Bladder Mucosa.—In involvement of the bladder mucosa of a congestive hyperemic nature frequency of micturition results, more especially if the trigone or the urethrovesical junction is involved. This may be caused by drugs taken internally, by the irritating influence of certain articles of food, by inflammation about the bladder, by the pressure of exudates or tumors about the bladder, by masturbation, and by the congestion of menstruation and pregnancy. Hysteria and neurasthenia are conditions not infrequently associated with frequency of micturition. In the so-called "irritable bladder" there are congestive changes in the area of the trigone and especially at the urethrovesical junction. These points are very sensitive, and during the daytime, when the patient is in the standing position, urination is very frequent, but at night little or no annoyance may be felt. Many of these cases are probably the result of previous infections which leave behind only this congestive, hyperemic, sensitive alteration.

In that frequent form of bladder involvement which affects the trigone and which is known as hyperemia or a neurosis or irritable bladder, there is only a simple hyperemia of the trigone, as seen in pregnancy and pelvic disease, due to dilata-

tion of the blood-vessels as the result of increased blood-supply in the pelvis. Simple hyperemia usually disappears on removal of the cause, whereas chronic inflammation of the trigone is more persistent. A distinction between a hyperemia and a real trigonitis is often difficult.

Clinical Classification of Cystitis in Women

Irritation of the bladder.
Acute cystitis.
Subacute cystitis.
Chronic cystitis (usually trigonitis):
(*a*) trigonitis pseudo-membranosa.
(*b*) cystitis cystica.
(*c*) hemorrhagic cystitis.
(*d*) ulcerative cystitis.
Tubercular cystitis.
Gonorrheal cystitis.
Syphilis of the bladder:
(*a*) ulceration.
(*b*) trabeculation.
(*c*) gumma.
Hunnerian ulcer.

Cystitis.—The causes of cystitis are as follows: (1) Infection per urethram, such as cystitis following genital infections, the cystitis occurring post partum, and catheterization cystitis; (2) bacteria coming down from the kidneys; (3) hematogenous or lymphogenous infections of the bladder. Special forms are cystitis complicating stone or neoplasms, and tubercular cystitis, descending from the kidney as a rule.

Bacteria of Cystitis.—True inflammation of the bladder is produced by bacteria introduced through the urethra or eliminated through the kidney, descending from the kidney in pyelitis, pyelonephritis, pyonephrosis, or tuberculosis. Bacterial infection is often evidenced by the additional symptoms of pain and pyuria. The bacteria most often found are the bacterium coli, tubercle bacillus, the gonococcus, streptococcus, staphylococcus, and yeasts. It is far more satisfactory to have cultures made of the urinary sediment for the identi-

fication of bacteria than to rely upon a simple microscopic examination. Bacteria may be introduced by the catheter, resulting in catheterization cystitis. Bacteria, however, may enter, and frequently do so, without this mechanical aid, as can be seen from the extension of a gonorrheal urethritis. This bladder involvement per urethram not infrequently takes place with profuse pathologic discharge from the vagina, cervix, and uterus. The bacterium coli, especially in older women with lacerations of the perineum and uncleanly personal care, comes directly from the rectum. Infection of the bladder by the colon bacillus is extremely common in older women, and is comparable to senile vaginitis, where tissues of little resistance permit of bacterial invasion and growth.

Alterations in the Mucosa in Acute Cystitis.—Seen through the cystoscope, the normal mucosa of the bladder, except that of the trigone, is pale in color. There is a slight yellowish-rose tint. There are numerous delicate vessels which in various spots resemble a picture of the retina. In inflammation the mucosa becomes redder than normal. There is a diffuse capillary injection and an increase and dilatation of the larger vessels. These changes are easily recognized through the cystoscope.

In acute cystitis there is a pronounced vascularization and filling of the vessels, especially near the neck of the bladder and in the trigone. The mucous membrane may become edematous, hyperemic, and show ecchymoses. The superficial epithelia are destroyed and mixed with the urine. In severe cases there is small-celled infiltration of the mucosa and the muscularis.

At various points the mucosa is red in spots or in larger areas. At those points where purulent exudate or tumors compress the bladder wall the small vesicles described by Kolischer are present. According to Kolischer, gonorrheal inflammation of the bladder shows numerous inflamed red spots, about which the bladder mucosa seems normal. In inflammation of the bladder areas of the mucosa may be covered by attached mucus or encrustations of salts.

In severe cases, especially with gonorrhea and tuberculosis, ulcerations may be present. Tuberculosis of the bladder occur-

ring from infection of the kidney shows most marked involvement in the neighborhood of the ureter. There may be miliary nodules grouped together and surrounded by areas of injection. There may be ulcerations of small character or there may be a large area of ulceration, especially marked around the opening of the ureters, and the ureteric opening is usually dilated or distorted. The cystoscope divulges congestion of the mucosa, roughening of the mucosa, edema of the mucosa, the presence of vesicles, tubercles, and ulcerations. There is often a solitary linear ulcer on the anterior wall, and the bladder itself is usually found so contracted that its capacity is less than 4 ounces.

Gonorrheal Cystitis.—Gonorrheal cystitis appears under the form of cystitis colli. There is frequent desire for urination and very severe pain, especially at the end of urination. Frequency of urination is more marked than in all other acute forms and may occur every five or ten minutes. True gonorrheal cystitis (gonococcal invasion of the bladder wall) is rare. Cystitis concomitant with gonorrhœa is common.

Acute gonorrheal cystitis is either catarrhal or purulent. The catarrhal form produces an acid urine containing mucus, large bladder epithelia, and many micro-organisms. The urine of the acute purulent form has a neutral or alkaline reaction, contains pus cells, numerous micro-organisms, and many bladder epithelia. If alkaline, the urine may be malodorous.

The chronic form results subsequent to an acute infection and may present objective evidences of the above nature with but few subjective evidences. In the alkaline form the urine should be kept acid by the administration of salicylic or benzoic acid.

Gonorrheal urethrocystitis causes frequent micturition, worse by day. The urine is acid. Colon bacilli may produce a cystitis without apparent cause after marriage from lesions to the hymen. In certain cases each time after coitus, especially with vaginismus, or with senile atrophy of the vagina, there occurs a cystitis with possible secondary pyelitis. When the attempts at coitus are omitted the condition improves.

Idiopathic Cystitis.—So-called idiopathic cystitis occurs readily in women because the short urethra allows bacteria to

enter the bladder, especially in association with pregnancy and post partum. It is not improbable that this form of cystitis is frequently the result of uncleanly personal habits. Every cystitis except the tubercular form and the form associated with malignant growths improves by treatment of the bladder, whereas pyelitis does not. The characteristics of so-called "idiopathic cystitis" are the same as in the following form.

Catheterization Cystitis.—Catheterization cystitis is not infrequent after labor and operation. The urine is cloudy, contains pus cells, numerous bacteria, and mucus, and frequently undergoes ammoniacal degeneration. Normal urine is slightly acid, ammoniacal urine is alkaline. The colon bacillus does not cause ammoniacal degeneration, hence the reaction of the urine in colon bacillus cystitis is acid. The same is true, as a rule, of the gonococcus form of chronic cystitis. In tubercular cystitis the urine is also acid. The various forms of staphylococci are the cocci generally responsible for ammoniacal degeneration of the urine. In addition, this condition is caused by the proteus vulgaris of Hauser.

Alterations in Chronic Cystitis.—In the chronic cases the main changes are in the trigone and at the neck of the bladder. The mucous membrane becomes gray, swollen, thickened, succulent. The gray film on the surface of the trigone is responsible for the term "trigonitis pseudomembranosa." Epithelium is destroyed in the upper layers and there is round-celled infiltration in the submucosa. There may be seen typical granulations or more marked round excrescences, or else villous outgrowths. In extremely severe cases ulcerations may occur (ulcerative cystitis).

In very chronic cases the bladder wall, instead of being up to 10 mm. in thickness, is often 2 to 3 cm. thick. The bladder wall shows changes in the interstitial tissue, which is increased. This condition constitutes a fibrosis, according to Garceau. In the earlier stages there is total or partial desquamation of the epithelium, and later on the whole internal coat is cast off, leaving only a connective-tissue lining. Sometimes the epithelium instead of being cast off proliferates, forming patches of

leukoplakia or papillary glandular plaques giving the trigone and vesical neck a villous, velvety look. Occasionally small cysts are formed (cystitis cystica). If necrosis of the superficial layers takes place, we have a membranous cystitis. The most common lesion is hypertrophy of the muscle wall. Muscular hypertrophy is indication of extreme chronicity, or previous attacks of cystitis.

Trigonitis.—A frequent form of cystitis is that which affects the trigone, and is often called cystitis coli. There may be a simple hyperemia of the trigone, seen in pregnancy and pelvic diseases, due to dilatation of the blood-vessels as the result of increased blood-supply in the pelvis. A distinction between a hyperemia and true inflammation is often difficult. In some cases not only the trigone, but the vesical neck and the urethra, have a characteristic scarlet red appearance. The urine is not much altered in these cases, but careful examination shows excess of epithelial cells, some blood and pus, and various bacteria. Two-thirds of the bladder involvements in women are this chronic inflammatory trigonitis, previously described as cystitis. In the later stages there may be proliferative processes leading to the formation of papillary or warty excrescences, which show marked round-celled infiltration and change of the cylindric epithelium to squamous.

Irritable Bladder.—As "irritable bladder" we consider the cases of hypersensitiveness for which a tangible or gross cause cannot be found. Many authorities substitute the phrase cystitis coli, for the phrase "irritable bladder." In hysteric and neurasthenic people, more so than in healthy people, increased frequency of urination results from psychic excitement. Irritable bladder has two groups of causes: (1) Any changes on the part of the genitalia or the pelvic organs which may be brought into etiologic relationship with the hyperemia or congestion at the base of the bladder; (2) organic or functional nerve diseases and disturbances of the ductless glands accompanied by nervous manifestations. The often-discovered dark color of the trigone points toward general hyperemia of the pelvis. In chronic cases there is desquamation of the thickened epithelium. Occasionally the hyperemia seems to

be the remnant of a chronic cystitis. In vaginal and abdominal operations it may be seen that the tremendously dilated veins of the pelvic connective tissue, and in the neighborhood of the bladder, are often developed to a great degree. Thus venous hyperemia is not always a simple congestion. There is often a development and dilatation of the venous vessels which remain as a residuum of pregnancy, just as in subinvolution we find an enlarged uterus with congestion, etc., without there being real inflammation.

A hyperemia of the trigone is often associated with the changes in the entire venous system of the pelvis. It is not caused by just simple changed position of the uterus.

Before and during menstruation there is hyperemia of the bladder, especially of the base and the trigone. Most cases of cystitis become worse during menstruation, and even tend to develop during a period. The same annoyances are accentuated in those cases where there is chronic congestion with or without dilated veins. In the earlier stages of pregnancy, before any pressure is possible on the part of the uterus, there is an active hyperemia of the bladder. After labor the cystoscope shows that following prolonged labor there is mechanical injury to the bladder mucosa. Associated with this, there is of course stretching of the bladder base, and injury to the veins about it may be pronounced. There may result a subinvolution of the bladder and a permanent stasis in the dilated veins. This hypotonus of the bladder may last a long time or may be permanent. Severe annoyances may result from retroflexion of a gravid uterus, if the retroflexion is not corrected, and if the pregnant uterus becomes incarcerated. In the vast majority of instances there occurs, without symptoms, a spontaneous correction of the retroflexion.

There is, therefore, often found in the uterovaginal plexus and uterovesical and in the pampiniform plexus decided varicose dilatation of the veins. Through the slight development of valves changeable degrees of dilatation are produced by sexual excitement, especially if not gratified, menstruation, position of the uterus, subinvolution, etc., which may cause, in addition to vesical annoyances, many backaches heretofore not

explained. In some cases there may result a varicocele; the same may happen in the region of the trigone.

Shrunken Bladder.—In the chronic forms, resulting from neglected uncured cases of cystitis, there may be huge muscular hypertrophy of the bladder wall. This hypertrophy results in diminution of the cavity of the bladder; the bladder holds little urine and is much contracted, so that the capacity is limited to 4 ounces or less. This is the "shrunken bladder," which must be treated by gradual repeated distention. It is most common in uro-genital tuberculosis.

Pyelitis.—In the vast majority of cases of cystitis the cause is due to the bacterium coli. They enter the bladder in various ways. In pyelitis the bacterium coli is present in 95 per cent. of the cases. There has been a division of opinion regarding the mode of infection into two forms, the ascending and the descending. At present the majority believe in a descending primarily hematogenous path. A primary pyelitis may occur in pregnancy, which is caused or furthered by the pregnancy. If these cases are examined by the cystoscope early enough the bladder is seen to be normal, and pus is seen coming out of the ureters, which speaks for a primary involvement of the kidneys. The course in pregnancy is characterized by attacks, remissions, and relapses. The fever may be of various degrees, may be continuous, intermittent, remittent with chills, the pulse corresponds to the temperature, the general condition is disturbed, there is fatigue, headache, nausea. The most important sign is pain in the region of the kidneys, usually on the right side. The pain often radiates along the ureters, *but the region of the bladder is scarcely ever tender*. The pain may radiate into the thighs, into the back, and toward the shoulders. Some cases are so mild that they are overlooked. Examination of the urine must be made frequently. Many cases of "pregnancy fever" are due to this condition. As an accompaniment of the hidden or latent type we must reckon the nausea and vomiting that sometimes occur in the latter months.

The duration of an attack of acute pyelitis is, in most cases, about a week; in some instances the fever lasts only two days, and in severe cases, with numerous chills, it may last a month.

There are many cases in which the specimen does not change and the condition continues up to and after labor, and there is always danger of a new attack of fever. The recurrent attacks, whether before labor or after, are rarely as acute as the first one. In many instances the urine becomes normal, and there is not the least sign of the disease. These cases are not to be considered cured; they simply *seem* cured. In children cystitis is very frequent, more so in girls. Very frequently the *whole* urinary tract is involved and it is not a simple cystitis. Among those children where the bladder and the kidney pelvis are affected 98 per cent. are girls. The most frequent age is from the first to the third year. Therefore, among children there is malproportion in favor of the girls; the condition lasts often a long time, and is ten times as frequent as in adults. The conclusion seems, according to Kermauner, to be reached that there is no "pyelonephritis of pregnancy," that it is only a relapse of a latent, symptomless, unrecognized disease which has been lasting for years or for decades since childhood.

As regards cystitis in pregnancy, experiments have shown that the bacterium coli may remain in or inhabit the bladder and the urethra and pelvis of the kidney and remain quiescent for a long time. This does not hold good for streptococci, or very often for staphylococci. The bacterium coli is a constant inhabitant of the urethra in pregnancy. The light forms of pyelitis have no characteristic symptoms. Even severe forms may develop without a special clinical picture. When general symptoms develop they are of a septic nature. Important among symptoms is the spontaneous sensitiveness to pain pressure, in the region of the kidney, and the finally increased resistance in that region and the change in the urine. The urine in acute cases is cloudy, contains mucus and pus, epithelia and bacteria. The reaction is acid, and the microscopic findings in pyelitis are not necessarily characteristic for the diagnosis, as against cystitis. On the right side many an appendix has been removed when the condition was really a pyelitis. In some cases the bladder symptoms predominate. In one-fourth of the cases which are finally recognized as pyelitis, nothing points toward the kidney and the ureter. There are no pathogno-

monic symptoms. From the complaints of the patient, and from the character of the urine, a cystitis is diagnosed. A very important therapeutic measure consists, in many cases, in laying the patient on the sound side.

There is probably no other condition so frequently overlooked in women as chronic pyelitis, for a positive diagnosis cannot be made without cystoscopy. When the urine contains small flakes and some definite micro-organisms, the bladder shows some form of trigonitis, the ejection of indigo-carmin is slightly delayed on the affected side, and the same germ is present in the urine collected through a ureteral catheter from the kidney that is found in the bladder urine, the diagnosis is made. The treatment of these cases must include irrigations of the renal pelvis with 0.5 per cent. silver nitrate, or some other antiseptic solution, before a cure can be expected.

Tuberculosis.—It is extremely doubtful whether tuberculosis is really ever primary in the bladder. It is always secondary to some lesion situated elsewhere in the body which serves as a primary focus and is usually secondary to tuberculosis of the kidney. Vesical tuberculosis is first ulcerative in form; second miliary; the cystoscope shows numbers of small red patches in which the tubercles are later to appear. In the early stage there are small gray nodules, sometimes isolated, sometimes grouped, giving the impression of follicles. Inflammatory reaction results and the tubercles undergo degeneration, become soft, and there finally results ulceration. Around the ulcerations there are inflammatory areas. There is much vascularization and ecchymosis. In advanced cases the process goes deeper than the surface, the bladder muscle is thickened and shrunken, and the lumen of the bladder is much diminished. The various stages are gray nodules, yellow nodules, small areas of softening, larger confluent ulcers, secondary inflammation of the mucosa and muscularis. As almost all cases are of the descending form, the earliest nodules are seen near the openings of the ureters. Later on the condition becomes more general. The trigone, the area from the ureters to the neck of the bladder, is the favorite point of location, although tubercular areas may occur elsewhere. The usual cystoscopic picture

consists of a solitary linear ulcer on the anterior wall of the bladder, marked distortion of the ureteric orifice on the affected side, edema, ulceration or tubercles near the opening of the ureter, and distinctly more involvement of one lateral half of the trigone than the other. The bladder capacity is almost invariably markedly decreased, and any bladder that will not tolerate more than 4 ounces of warm boric acid solution should arouse suspicion of tuberculosis at once.

Stone and Neoplasm.—Stone in the bladder in women is comparatively rare. Foreign bodies in the bladder may be introduced in attempts at masturbation. Tumors of the bladder in women occur most often in the neighborhood of the ureters and on the lateral walls.

DIAGNOSIS

The three important symptoms of cystitis are: (1) Frequency of urination; (2) pain; and (3) pus in the urine. The more acute the process, the more marked are the first two symptoms.

When fever is present, pyelitis or some other condition must be suspected, as cystitis is rarely if ever accompanied by pyrexia.

The normal bladder requires emptying when between 300 and 500 c.c. of urine are present. In cystitis frequency of urination exists with small amounts of urine in the bladder. This desire exists by day and by night. In the nervous form of frequent urination there is little or no annoyance at night.

Pain.—In cystitis pain may occur before, during, or after urination. In many cases the pain lessens as soon as the bladder is empty. In some, especially if the lesion is near the neck of the bladder, the pain is felt at the end of urination. Agonizing tenesmus is frequently present in acute cystitis.

In considering the pain associated with urethral or bladder conditions we find that pain may come on during urination, may become worse on urination, may be relieved on urination, or may be felt most markedly after the bladder is emptied. Constant pain means a cystitis and perhaps a pericystitis. Pain present before urination and which is relieved by urination is due to the bladder. Pain made worse during urination is due to urethral causes. Pain felt mostly after urination is completed

is often due to pelvic peritonitis and adhesions to the bladder which are made tense by contraction of the bladder.

Pyuria.—There are, as stated, forms of mild inflammation with hyperemia of the mucosa in which there is no pus. As a rule, there is no cystitis without pus or bacteria in the urine. The more diffuse the process, the greater the amount of pus. Hematuria is not a constant symptom of cystitis. In diagnosing involvements of the bladder, examination of the urine is of importance. The urine should be withdrawn by the catheter and allowed to stand in a urine glass for several hours, or, better still, should be centrifuged. The best procedure is to centrifuge a large amount of urine. The sediment should be examined. If the sediment does not dissolve on heating a specimen of urine or on the addition of acetic acid, it is composed of pus or epithelium or blood or bacteria, or combinations of these elements. If it is increased by heating and does not disappear on the addition of nitric acid, we have the usual test for albumin. The microscope aids in the finding of pus cells, of epithelia, of blood, of bacteria, and of urine crystals. The bacteria most sought for are colon bacilli, gonococci and the tubercle bacilli.

Continued purulent discharge from the bladder, especially if there is pain in the region of the kidney, demands careful microscopic examination, a staining for tubercle bacilli, and the use of the cystoscope and the use of the other urologic diagnostic procedures.

Chronic cystitis is the most frequent cause of dysuria. Whenever the urine, in any but an acute cystitis, contains much pus, the cystoscope should be used with or without catheterization of the ureters. Blood may be present in acute cystitis mixed with pus. In other conditions, especially if there is blood without the presence of pus, a severe affection or new-growth of the bladder or kidney is probable.

If none of the above causes are present, and if diseases of the ureter, the pelvis of the kidney, and the kidney itself can be excluded, we may come to the conclusion that frequency of micturition is due to a general or a local neurosis or to "irritable bladder."

The retroflexion of a gravid uterus may bend the urethra, compress it against the symphysis, and result in a tremendously dilated bladder, from which the urine dribbles. Infection of such a bladder may cause a necrosis of the mucosa.

The urinary stasis incident to "pocketing" of the bladder in cases of cystocele and sometimes following interposition operations done for the cure of prolapsus or cystocele, is often productive of pyuria and cystitis.

DIAGNOSIS OF TUBERCULAR CYSTITIS

In the early stages when the process descends from the kidneys, there is increased frequency of urination and perhaps bleeding. Pain is slight. Increased frequency of urination and suprapubic discomfort or pain are usually the first subjective manifestations of the disease, although hematuria is sometimes the primary symptom. The urine in this period is clear, but at times there may occur bleedings of short duration, usually at the end of urination and not affected by activity or rest. Mixed infections are not uncommon.

When in the course of a few months around the circumscribed areas there develops a tubercular cystitis, there is frequency of urination, pain on urination, and pus is sometimes found in the urine. The frequency of urination is now very marked and is uninfluenced by treatment, especially if the condition has advanced over the trigone to the neck of the bladder. Urination is then accompanied by pain at the end of micturition. The bladder contracts in tenesmus. The urine is acid (which is also true of most forms of cystitis).

Tuberculosis of the bladder is secondary to tuberculosis of the kidneys and ureters and the involvement of the ureteric orifice will indicate which kidney is affected, even though it is difficult to find the tubercle bacilli in the urine from that side. There is frequency of micturition at night. Pain comes on gradually and is noted in urination or may be more or less steady. When cheesy degeneration of the tubercles occurs, pus appears. The symptoms are those of a chronic cystitis.

The amount of pus is fairly large, for, in addition to the localized processes, the entire bladder is inflamed. The appearance of blood, even if only in the form of red blood-cells

recognized by the microscope, is almost always noticed in tuberculosis. The tubercle bacilli can be found in 80 per cent. of the cases and must be distinguished from the smegma bacilli. Very often, however, it is necessary to make repeated, careful, and prolonged examinations before they are discovered.

Tuberculosis should always be suspected, especially in younger women if other causes are absent. There is frequency of urination, pyuria, pain on pressure and examination. The tubercle bacilli should be looked for. The cystoscope should be used and guinea-pigs should be inoculated. According to Kolischer, urinary tuberculosis is a disease of young adult women, generally occurring in the kidney primarily, and unilateral. Bladder symptoms are the first cause of complaint. The kidney involvement must be diagnosed from appendicitis and gall-stone colic. In about half the cases heredity is concerned in the etiology.

In those cases in which tubercle bacilli cannot be found the fact that other bacteria are not present is of importance. Tuberculous urine in which no tubercle bacilli are found is characterized by the fact that, not always, but very often, no other bacteria are present. In contrast with other forms of cystitis, no etiology is evident. The pain is generally severe. The bladder is intolerant of large amounts of fluid. A "cystitis" which does not improve under nitrate of silver, but which grows worse, is likely to be tuberculous. The cystoscope is essential to the making of the diagnosis.

TREATMENT OF CYSTITIS

The following remedial measures are used in the treatment of cystitis, and other lesions of the bladder:

Internal medication.
Intravesical irrigations.
Intravesical instillations.
Intravesical topical applications.
Vaccines.
Electrotherapy:
a. high frequency.
b. cautery.
Operation.

The most popular and widely used drug in the treatment of cystitis is hexamethylenamine, which is probably better known under its trade name, urotropin. It should not be forgotten, however, that it has no power to allay inflammation, that its sole virtue lies in its germicidal properties, and that it is practically inert in an alkaline or neutral medium. For the latter reason, it should always be combined with an acid salt, to insure acidity of the urine, and with liberal quantities of water. Some urologists advocate large doses, while others believe that comparatively small ones are just as efficient, and that an excess of hexamethylenamine in the urine, particularly if not completely disintegrated, may be irritating to the uro-genital tract.

℞. Hexamethylenamine
Sodii benzoatis..... āā ʒiiss
M. et fiant chartulæ no. xx.
S.—One powder, with a full glass of water, every four hours.

℞. Hexamethylenamine..... ʒiiss
Acidi sodii phosphatis..... ʒiiiss
M. et fiant chartulæ no. xx.
S.—One powder, with a full glass of water, every four hours.

Helmitol is a preparation similar to urotropin, except that it is supposed to act in an alkaline medium. It is given in 15 grain doses three times a day.

The pain associated with acute cystitis may be relieved by a suppository containing 1 grain of extract of opium and 1 grain of extract of hyoscyamus in ol. theobroma. The fluidextract of uva ursi, 2 drams three times a day, is a slight stimulant and astringent and is of value in the early stages. Capsules containing 20 per cent. kava-kava and 80 per cent. sandalwood oil have a sedative effect which is often desirable. Balsam of copaiba, 15 grains in capsules, is a local stimulant to the mucous membrane.

℞. Ext. opii..... gr. v
Ext. hyoscyam..... gr. v
Ol. theobrom. q. s.
F. suppositor. rectal. no. v.
S.—One morning and night for pain.

℞. Ext. cannab. ind..... gr. v
Ext. hyoscyam..... gr. v
Sacch. lactis..... ʒj
M. f. pulv. Div. in dos. x.
S.—Three to five powders daily for pain.

In many cases of increased frequency of urination in nervous women, in whom the clinical evidence of cystitis in not marked, the following mixture will be found of service.

℞. Sodii bromidi ..... ℥ss
Chloralis hydratis ..... ℥ii
Tinct. hyoscyam ..... ℥v
Glycerin ..... ℥iii
Aquæ menth. pip q. s. ad ..... ℥iv
M. S.—One teaspoonful in a little water every four hours.

Among the other drugs given internally are the alkalies, which should be given in the early stages of pyelitis only if the urine is very acid, and never enough to render the urine alkaline. The best of the alkalies is citrate of potash. This may be prescribed in the form of:

℞. Liquor potassii citratis ..... ℥vj
S.—One tablespoon every two hours.

Or:

℞. Potassii citras effervescens ..... ℥iij
S.—℥ss in water every two hours.

The bottled waters, such as kalak water, may be used; or:

℞. Potass. bicarb ..... ℥j
Tr. hyoscyam.
Ext. kav. kav. fl ..... āā ℥ss
Aq ..... ℥viij
S.—℥ss two hours after meals.

The alkalies are of value in some cases of acid cystitis, and in those cases of irritable bladder which are associated with acid urine. They should be used in gonorrheal cases only to diminish very marked acidity.

Vaccines have been used by some men with satisfactory results, but in our hands have proved a great disappointment. No improvement from their use has been observed in cases of cystitis, although occasionally some benefit has apparently been derived from their use in cases of pyelitis. At any rate, no harm can come from their employment. We would urge, however, that a culture be made of the urinary sediment, and an autogenous vaccine be prepared from the culture. This will at least be more efficient than a stock vaccine.

The local treatment of acute cystitis should be extremely gentle. A preliminary washing of the bladder is of value to remove pus and bacteria. Warm normal salt solution, 2 drams of salt to the quart, or boracic solution, 4 per cent., are used for the preliminary washing, either of which fluids have a non-irritating influence on the mucous membrane. This irrigation should be followed by instillation of fluids which have a destructive action on the bacteria and which exert a stimulative influence on the epithelium, and so aid in the throwing off of bacteria. Protargol and argyrol, while not quite so valuable in this respect as silver nitrate, are much less irritating and should be used in the acute stages. Protargol works well in the diluted strength of 1:800 up to 1:100 in the acute stages, and from 1 to 5 per cent. in the more stubborn cases. About 4 ounces are injected into the bladder and allowed to remain for five to ten minutes. If the bladder is extremely sensitive, it can be anesthetized by injectingan ounce of a 1 per cent. solution of eucain or 2 per cent. solution of alypin, which should be left in place for 20 minutes. In the subacute stages and in chronic cases nitrate of silver diminishes congestion and stimulates regeneration, as well as being a valuable germicide. It should be used in solutions of 1:10,000 and gradually increased to 1:5000. The strength of any of the irrigations depends to a certain extent upon the sensitiveness of the bladder, which can be judged by the preliminary washing with saline or boracic solution and by the amount which the bladder can hold when this preliminary solution is injected.

Mercurochrome 220, 1 per cent., and acriflavine: 1:1000, are powerful germicides. In many cases of colon bacillus infection that do not respond to silver nitrate, carbolic acid 0.5 per cent. is often useful. As toleration is established, its strength may be gradually increased up to 2 per cent. Oxycyanide of mercury, 1:5000, is extremely efficient in syphilitic cases.

When there is bleeding, a 1 per cent. solution of alum is of great service. Permanganate of potash is an antiseptic of value and may be used in the strength of 1:10,000. This solution is particularly valuable in ulcerative cystitis.

In chronic cystitis urotropin has a splendid effect. While urotropin, salol, and helmitol (helmitol acts in an alkaline urine) are useful urinary antiseptics, yet in many of the cases of chronic cystitis with acid urine the urine must be rendered less acid or else alkaline.

Cases of chronic cystitis with contracted bladder must, in addition to the use of the medicated solutions, be treated two or three times a week by the injection of boracic solution under the pressure of a syringe up to the full capacity of the bladder. At each successive treatment more should be injected, so that in the course of weeks or months the capacity of the bladder is increased. These are cases of old, long-neglected cystitis with marked hypertrophy of the bladder wall. Treatment of such cases takes months or years. General tonic treatment, rest, and plenty of fresh air are essential in curing many cases of chronic cystitis.

The treatment of simple "irritable bladder" is as follows: The bladder is thoroughly irrigated with a solution of boracic acid through a catheter. After irrigation with boracic acid solution the bladder is then emptied and 8 ounces of a 1 per cent. watery solution of ichthyol are introduced, which the patient is to retain for one-half hour, if possible. This treatment is repeated every other day. If this fails mild solutions of silver nitrate must be used. Seven grains of urotropin are given four times daily, or else, with very acid urine, citrate of potash several times daily. In the milder forms of irritable bladder Wildungen water without local treatment arrests the acidity of the urine.

In every case with symptoms of cystitis, disease of the kidneys should be excluded. In cystitis of uncertain etiology the urine should be examined for tubercle bacilli. Pus in the urine without the finding of the usual pus micro-organisms speaks strongly for tuberculosis. In the treatment of vesical tuberculosis preliminary removal of the diseased kidney is absolutely necessary and subsequent treatment of the bladder is essential. In addition to relieving the patient of the dangers and tremendous annoyance of vesical tuberculosis, it must be borne in mind that the ureter of the sound side may become involved by the

tubercular process. Rovsing treats tuberculosis of the bladder as follows: The bladder is first irrigated and then 50 c.c. of warm 0.5 per cent. solution of carbolic acid is injected and allowed to remain for three or four minutes. If it returns turbid, the method is repeated until it returns clear. A rectal suppository containing ½ to 1 grain of ext. opii is introduced to lessen the pain which may follow the treatment. The treatment is repeated every other day until the urine remains fairly clear between visits, and then the interval is gradually lengthened.

In every case of suspected tuberculosis, especially if the cystoscope is not used or when the cystoscope shows the bladder to be healthy, a specimen of urine should be drawn from the bladder by catheter under aseptic precautions and sent to a pathologist for guinea-pig inoculation.

In all cases that are characterized by severe tenesmus intravesical instillations of 20 per cent. oil of cajeput in sterile olive oil give almost instantaneous relief. Twenty c.c. may be introduced every day.

Spots of obstinate ulceration frequently yield to topical applications of pure silver nitrate, fused on the end of a probe.

In the treatment of those cases of irritable bladder due to or associated with pelvic inflammation or uterine displacements, the bladder should be treated as described above. In most instances, however, no improvement of a permanent nature results without treatment and medical or surgical correction of the pelvic disease. In the treatment of irritable bladder, due to a general nervous condition or to hysteria, the use of alkalies to combat the acidity of the urine, and general treatment for the neurotic condition, are the modes of procedure.

ASSOCIATED NERVOUS CONDITIONS IN GYNECOLOGY

PUBERTY

Constitutional Changes Produced by the Ovaries.—Marked, constitutional changes occur at puberty, during menstruation, during pregnancy, and at the menopause. The relation between the changes occurring at puberty and at the menopause, before menstruation, and after menstruation, during pregnancy and after pregnancy, show a decided resemblance. Until shortly before each menstrual period, temperature, pulse, muscular activity, lung capacity, and the excretion of urea increase, and reach their maximum two or three days before the appearance of blood. During this period we find hyperemia, edema, increased activity of the ovary, changes in all the mucous membranes, and increased function of all the glandular apparatus. These and the occurrence of swelling of the breasts, tenderness of the abdomen, even pain, and the passage from the vagina of greater amounts of mucus, sometimes mixed with blood, prove at the beginning of each menstrual period a wave movement and increased general blood-tension due to the ovaries and their secretion. During and after menstruation regressive changes are evident.

During pregnancy we have an increased amount of the watery elements of the blood, an increased proportion of fibrin, a diminished amount of albumin, an increase in the white blood-cells, a relative diminution in the number of red blood-cells and in the amount of hemoglobin.

Before labor the temperature is higher in the last three months of pregnancy, and there is an increase in the elements of the body, equal to one-thirteenth of the body-weight. This increase is due in part to serous infiltration, and to the increased ability of the body to form organized tissue. Post partum, after a temporarily short rise, the temperature is lower, the blood-pressure sinks, and becomes normal on the ninth day. After labor there is a diminution of tissue change and a diminution in the amount of urine.

As regards temperature, blood-pressure, hyperemia, the amount of urine secreted, etc., there is always a similar increase before menstruation, and a like decrease in intensity during and after menstruation, as during and after parturition, so that Virchow has well characterized menstruation as a *labor en miniature.*

NERVOUS SYMPTOMS AT PUBERTY

There is marked development at puberty in the female, which occurs earlier than in the male. This period, from the thirteenth to eighteenth years, is a trying one for the girl, and is characterized by diminished general resistance. The increased blood-supply in the genital area, and the increased arterial tension produced by the ovaries and their internal secretion, cause at puberty backache, a sense of drawing in the back, sensations of pressure in the pelvis and in the region of the uterus and ovaries. There is a feeling of weight and weariness in the lower extremities. Girls may become suddenly pale or flushed, alternately hot and cold. There is sometimes a slight rise in temperature. There are changes in the activity of the intestines, bladder, and stomach. Most marked is an irritability of the nervous system. There is a tendency to depression and "blues." The nervous system is often affected even before the establishment of menstruation, and among the symptoms may be headache, lassitude, irritability, rings under the eyes, general discomfort, epigastric pain, loss of appetite, palpitation of the heart, dizziness, weakness, and weight in the lower extremities. All these may last for months and may weaken the general system and diminish its resistance.

Among the prodromal symptoms are swelling of the breasts, meteorismus, watery, mucoid vaginal discharge, pruritus vulvæ. Any or all of the above symptoms may be magnified in any case and result in severe abdominal pain, in general weakness, marked dyspnea, diarrhea, headache, neuralgia. They are due to the menstrual stimulus produced by the functionating ovaries which are bringing follicles to full development and are producing a general constitutional hyperemia. During this period the relation between the ovary and other

organs, especially the thyroid gland, is being worked out either easily and harmoniously, or with marked difficulty.

Cardiac Symptoms at Puberty.—Among the cardiac symptoms noted at puberty is nervous heart palpitation, often in girls who are not anemic and who have no disease of the heart or blood vessels. It is related to the changes occurring in the genital sphere because it comes on with force a few weeks or months before the establishment of menstruation, occurs irregularly, lasts beyond the first menstruation, but disappears when regular menstruation is finally established. It is of four forms and is probably related in part to thyroid overactivity.

In the first, the pulse is rapid—between 120 and 140. It comes on at irregular intervals without cause or after slight excitement.

The second form shows a tachycardia, very rapid; it is premenstrual and comes on before the establishment of the first menstruation, but recurs regularly every three or four weeks before menstruation or during the menstrual period and lasts but a few days.

In the third form the condition is noted in girls in whom menstruation begins late, at eighteen, nineteen, or twenty, or in girls in whom there is irregularity of menstruation. Here the cardiac symptoms are sometimes marked. There is a decided and frequent palpitation and throbbing in the carotids. The skin is pale, there is diminished hemoglobin, there is asthenia, and nervousness. We have the picture of the chlorotic habit, often combined with evidences of the anemic form of lipomatosis universalis. There is often acne vulgaris, comedones, sweating of the hands, blueness of the nose and ears.

The fourth form is noted in girls who grow rapidly before the onset of menstruation. They are not anemic or nervous, but are usually very thin. There is palpitation, shortness of breath when active. The heart, in contradistinction to the other three forms, shows enlargement, and there is hypertrophy, especially of the left ventricle. Here development in the genital sphere has caused a storm in the vessel system which produces increased resistance to the work of the heart; the rapid growth of the body increases the heart's work. Corsets create

frequently an obstacle to the development of the rapidly growing body, the thorax, the breasts, and the upper abdomen, and add to the burden placed upon the heart (Kisch).

The Influence of Psychic Stimuli at Puberty.—The above changes are accentuated by processes going on in the psyche. The child observes changes in her form and outline, observes external evidences of puberty, is subject to psychic stimuli, all of which affect the general nervous system. The degree and character of the influence proceeding from the genitalia depend on the resistance of the nervous system, or on the temperament, hereditary constitution, education, and training. In children of families characterized by irritable excitability, in children in large cities, in children who work hard at school and high school, in children who early become cognizant of genito-sexual matters, in girls whose thoughts have been directed into abnormal channels by other children, all the changes occurring at the establishment of menstruation work with greater intensity and with manifold variations.

The immediate surroundings in which a young girl lives during her sexual development all have an influence. In the families of working-girls there is often too much physical labor, poor nutrition, work involving the use of the lower extremities, and often early sexual stimulation. In the country, on the other hand, the girls develop gradually and normally in surroundings which give them fresh air, nourishing food, and bring them less into contact with conditions which produce sexual suggestion. In the city, again, association with older girls, association with the opposite sex, early entrance into social life, attendance at theatre, and the reading of erotic literature all have a bad sexual effect. All these, added to the knowledge of development and the establishment of the menstrual function, and the character of the child's associations, determine the degree to which the hazy and indefinite "sexual instinct" follows a normal or perverted course. Psychologic reaction to the "sexual instinct" at puberty evidences itself in many ways, all of which represent the need of expressing objectively the newly developed inner feeling. Religion and poetry are often the fields in which these longings are expressed. Young

girls at puberty often give themselves up to enthusiastic admiration and adoration of ideals or concrete factors. The mind of adolescent girls is often occupied with thoughts which concern the objects of their affection. Exciting or immodest literature and plays and the influence of sophisticated associates may develop the indefinite, hazy, sexual inclination into a flame (Kisch).

The Influence of Heredity.—The surroundings and training of the young girl have much to do with the way in which ovarian activity acts on the brain and nervous system. Heredity, however, plays an all-important part.

A neuron, feebly endowed and without enduring qualities, is strongly influenced by the conditions which impair the general health. There then results a neuropathic disposition of the nervous organism which yields readily to severe strains and unusual influences. As Mendel says, an hereditary basis generates a predisposition to mental and nervous irritability and produces certain peculiar natures which deviate in thought and action from the average. These individuals with difficulty preserve their nervous equilibrium. Many psychic peculiarities arise from imitation in childhood, through vicious environment or by faulty training. The cramming in schools plays an essential part only if it forces slightly gifted children to unusual work and puts too great a strain on a weak general system.

The hereditary taint, especially if connected with anemia and onanism and infectious diseases, may form a basis on which nervous and mental alterations may develop between the twelfth and twentieth years, which alterations are most frequently of a hysterical nature. If children tainted hereditarily are exposed to mental exertion not corresponding to their powers, and if there is combined with this onanism and great loss of blood at the beginning of the menstrual epoch, a psychosis may develop at the time of puberty.

In the simple forms, the disease is generally characterized by hypochondriac depression, and the girls feel themselves incapable of physical labor. These children are backward at school, sleepless, suffer from headaches, cardiac palpitation, and loss of appetite. They become refractory, disobedient, and disrespect-

ful. These children are considered as lazy and ill-bred and the real condition is not recognized as pathologic.

The establishment of menstruation is especially liable to excite nervous disturbance in hereditarily neurasthenic and psychopathic girls.

Neuroses at Puberty.—Neuroses and psychoses may develop during puberty in such girls or in individuals living under unsatisfactory conditions of life or under the pressure of constant disturbing or irritating influences. Among these Kisch mentions hemicrania, precordial anxiety, epilepsy, imperative concepts, kleptomania, pyromania, and various phobias and anxieties.

The establishment of menstruation sometimes acts well and improves the nervous condition; especially so is this the case in well-developed girls who have not yet menstruated.

The inherited psychopathic tendency shows itself especially at puberty. The neurotic predisposition, kept in the background by the resistance and energy of childhood, takes on a sudden and stormy evolution through the menstrual stimulation and its associated constitutional involvement. Most frequently mania and melancholia are noted; then the morbid ideas associated with imperative concepts and the moral psychoses of puberty (Kisch). Hysteria often develops at the time of the establishment of menstruation. Commonly the first hysterical attack occurs in association with the first menstruation; or else the first menstruation brings back a previously existing but vanished hysteria. It is generally of mild from, consisting of attacks of laughter and tears, globus hystericus, and clavus hystericus. Hysteria major rarely occurs during puberty.

Nearly one-half of the cases of hysteria develop between the fifteenth and twentieth years of age. The frequency of hysteria diminishes rapidly after the twenty-fifth year. Bernutz says that one-half of the cases of hysteria in women evidence themselves shortly before or at the first establishment of menstruation. Amenorrhea and dysmenorrhea seem to stimulate the development of this nervous condition. Less frequently it is of the hystero-epileptic type. Associated with this

condition are commonly so-called nervous moods, weakness of will, nervous instability, and functional anesthesias, convulsions, and paralyses.

At the time of puberty there is a tendency in young girls of neuropathic heredity to epilepsy; it occurs suddenly with the first menstruation, and is generally then considered as a fainting fit due to the menstruation, but these attacks recur at each menstruation, and most of these attacks of fainting in association with menstruation prove to be epilepsy.

Among other conditions developing at puberty are migraine and chorea minor. Migraine often begins in young girls entering puberty between the thirteenth and fourteenth years. Chorea minor, which is a functional disturbance in the motor area of the nervous system, is observed during the period preceding and comprising puberty, and is to be brought into relation to the changes occurring during this period of body development, especially in girls.

NERVOUS SYMPTOMS IN CHLOROSIS

Among the symptoms of chlorosis are "irritable heart, dyspepsia, and constipation, due to atony and passive dilatation of the stomach and intestines. There is rapid exhaustion and fatigue of the skeletal muscles. There is a general sense of languor and lassitude. There is a great variety of spinal aches. Reflected neuralgias result from pressure on the spinal roots because the vertebræ are not kept in normal position by the weakened muscles" (Thomson).

In chlorosis there is often associated an under-development of the genitalia. The pelvis in a certain proportion of cases is of the child's type; in others there is a poor development of the external genitalia, or a uterus infantilis, small ovaries, poorly developed breasts, etc. Seventy-four per cent. have retarded genital development of one form or another. Among non-chlorotics these conditions are found in only 24 per cent. Menstruation is, as a rule, disturbed. During the chlorosis there is very frequently absolute or relative amenorrhea. Those affected with menorrhagia always show a decided change in the mucosa. In all, 77 per cent. present a weakening of the menstrual function.

Chlorosis is often hereditary, and occurs exclusively in girls, most frequently during the years of development and the years immediately following, and shows a tendency to recur. No theory with regard to chlorosis which leaves out of consideration its occurrence in girls only, at the time of or in connection with sexual development, deserves attention. It occurs most frequently between the fourteenth and twentieth years. According to Niemeyer, such cases as occur for the first time after the twenty-fourth year are almost never chlorosis.

Thomson believes the inference to be clear "that chlorosis is in some way related to the function of ovulation, and the problem is to find what this relation is."

Chlorosis is a disease of puberty, with a tendency to recur in later years. Here all the toxic elements which are so often met with as causative factors in other anemias are absent. The patients do not lose in weight, nor do they seem toxic. The hemoglobin sinks lower than the blood-cell count. The hemoglobin may decrease to 50 per cent. while the blood-cell count remains normal. Virchow describes a menorrhagic and amenorrheic form of chlorosis. The latter is the most frequent. This form shows small ovaries with few follicles. The menorrhagic form shows the follicles increased threefold. Virchow considered the hypoplasia of the genitalia as a secondary manifestation, and dependent on the hypoplasia of the vascular system. However, hypoplasia of the genitalia does not always show an accompanying hypoplasia of the vessel system, and, on the other hand, the hemorrhagic form may be associated with infantile genitalia. The modern opinion believes the weakened blood-forming power to bear a relation to the female sexual organs, since from them stimulation is furnished to the blood-producing structures. Just whether, or how much, a diminished or increased secretion of the ovaries bears a relation to these changes is not definitely settled. An even balance in the economy is dependent on the proper function of the ductless glands. Every change in them acts upon the character of the blood, since it is the blood which takes up the various secretions. In chlorosis there is usually a diminution of menstruation of various degrees down to total disappearance.

Menstruation may first begin between the fourteenth or sixteenth years or later. The bleedings are scanty and watery. The menorrhagic type is relatively infrequent, probably one out of five; it is possible that the menorrhagia is due to too much ovarin. A large percentage of chlorotic girls suffer from dysmenorrhea. These pains are sometimes due to the coagulation of the blood in the uterus, as there seems to be a tendency to more rapid coagulation in all but the most severe cases. Women with lung tuberculosis treated with tuberculin, according to Spengler's method, discovered that severe dysmenorrhea was frequently cured. Eisenstein and Hollos consider that dysmenorrhea is a part of a tubercular toxic reaction. They consider many of the symptoms which belong to chlorosis to be of tubercular origin, such as headache, dizziness, palpitation, indigestion, sleeplessness. Most of these symptoms disappear in a few weeks with the use of tuberculin (Eisenstein and Hollos). In dysmenorrheic women there often develop symptoms of chlorosis and tuberculosis. Graefenberg injected thirty dysmenorrheic women with old tuberculin and obtained twenty-one positive reactions. All positive cases belong to the group of primary dysmenorrhea; that is, the disturbances exist from the development of menstruation. All secondary dysmenorrheas are negative. Graefenberg considered chlorosis as a beginning tuberculosis. Hegar and others found tubercular heredity in half of the cases of chlorosis. If this be so, then at puberty, under the influence of ovulation, there is a diminished resistance and a greater sensitiveness toward various lesions, among the latter being tuberculosis.

A justification for the statement that chlorosis is due to diminished ovarian secretion is furnished by the effects of ovarian therapy in these cases. It may be considered that in chlorosis, with a failure of proper stimulation of the uterus and its lining, a diminished menstruation prevents thereby an excretion through the menstrual blood of toxins produced at puberty. There may likewise, at this stage, be a certain antagonism between the thyroid gland and the ovary. Since many of the cases of chlorosis present symptoms not unlike those found in Basedow's disease, it is possible that a too greatly diminished secretion of

ovarian extract causes a relatively increased amount of thyroid extract to circulate in the blood. This is indicated by the good results obtained by Seeligman and others in the treatment of typical morbus Basedowi with ovarian. The ovarian secretion is a stimulator of blood-formation, and causes a congestion of the genital organs. Thyroid extract, on the contrary, causes anemia of the genital organs, as is seen in the results sometimes obtained by the treatment of uterine fibroids with thyroid extract. It is possible that those chlorotic patients who take on fat have not alone a diminution in the function of the ovary, but likewise a diminution in the function of the thyroid, while those suffering with the milder symptoms of morbus Basedowi have, with a diminished secretion from the ovary, a relative over-secretion on the part of the thyroid.

NERVOUS SYMPTOMS DURING MENSTRUATION

The ovarian secretion produces every twenty-eight days a pelvic congestion, which is relieved, if no impregnated ovum is present in the tube or uterus, by a flow of blood from the uterine lining known as menstruation. Associated with this local congestion is a general congestion in the entire body, especially located in the various mucous membranes. This general congestion has naturally an irritating influence, and is more apt to increase any annoyance existing in the sensitive portions of the body. It increases the tendency to skin affections; it increases the tendency to headaches and to neuralgias; and it increases any tendency to excitability, mild hysterical attacks, etc. These results are due to the constitutional processes which are associated with menstruation and to the coexisting stimulation of the thyroid.

Schauta gives us the symptoms noted in other organs than the uterus during menstruation, and especially in dysmenorrhea—sensation of heat, cold feet, vomiting, pain in the abdomen, loss of appetite, frequency of urination, dyspepsia, headache, hysterical manifestations, etc. Among the latter there is conjunctival anesthesia, hyperesthesia of certain points in the abdomen, singultus, spasm of the glottis, epileptiform attacks. Recurrences of dysmenorrheic pain are sometimes enough to disturb the nervous system and to provoke neuroses and psy-

choses. One of the most important sequelæ of dysmenorrhea is headache, diffuse or of the form of hemicrania. Long-existing dysmenorrhea increases the tendency to the development of hysterical attacks.

Amenorrhea.—If the ovaries are functionating, there often occur strong painful molimina menstrualia, which appear at the time of the expected but omitted bleeding. If there is absence of or markedly diminished ovarian function, there are no local annoyances. Amenorrhea may be associated with mental irritability, skin hyperesthesia, and various neuralgias and true psychoses. Amenorrhea is often due to chlorosis, obesity, diabetes, and the abuse of alcohol and morphin, myxedema, and Basedow's disease. With these, of course, there exist the special nervous symptoms of the particular disease.

Menorrhagia and Metrorrhagia.—If of great amount, either produces anemia. Patients are pale, incapable of activity, suffer from palpitation of the heart and fainting attacks, and are prone to degenerative processes in the heart muscle.

ONANISM AS A CAUSE OF NERVOUS SYMPTOMS

Onanism must be reckoned among the factors which predispose to increased irritability of the nervous centers. Koblanck found that of thirty cases of amenorrhea all confessed to masturbation. Sixteen were married, and of these eight had borne children. The duration of amenorrhea varied from three months to several years. The symptoms were headache, dyspnea, and sleeplessness. The tendency to masturbation was especially strong at the time for menstruation. Attracted by the observation of Fleiss, Koblanck noted that many disturbances in the menstrual function, especially dysmenorrhea, are associated with circumscribed swellings of certain nasal areas, namely, the anterior end of the lower turbinated bone and the directly opposite area of the nasal septum. He found that this was produced by strong sexual excitement unaccompanied by the relief resulting from physiologic satisfaction of this state. For the treatment of amenorrhea, the stopping of the masturbation is a necessary factor.

Koblanck observed that menorrhagia was often due to masturbation and to disturbances of a sexual character. Sixteen

women with menorrhagia and metrorrhagia acknowledged abnormal sexual processes (especially interference with natural completion, due to a desire to prevent conception). The symptoms improved with the regulation of the sexual relation. These disturbances resulting through masturbation in the non-gravid aroused to him the question as to the possibility of evil results in the pregnant. He observed that unconscious eclamptics often practised onanism. He found in these eclamptics nasal swellings and enlargement of the thyroid lobes. He questioned twenty women who recovered from eclampsia, and many confessed to onanism in pregnancy. The desire to masturbate was observed in those who practised onanism before marriage as well as in those who had not made use of this practice before.

In the opinion of some, masturbation does not act injuriously through mechanical irritation, but does act injuriously psychically. It may be said, however, that masturbation does produce congestion which is not relieved and regulated by the omitted orgasm. What is the relation of masturbation to anomalies of menstruation and to psychic disturbances? If masturbation produces amenorrhea or disturbances of menstruation, we may infer a consequent alteration in ovarian secretion and its elaboration. If we grant that masturbation has an effect on menstruation, we may safely add psychic phenomena to the list of resulting evils. On the other hand, it may be asked whether masturbation is entirely a cause or a symptom, and whether onanism and amenorrhea are not often evidences of defective endocrine action and secretion and defective mental and nervous organization. At any rate, we may grant that increased nervous irritability is the result of onanism. More especially would this be true in the case of the pregnant woman. Onanie may be stimulated in very young children as a result of local irritation. In adolescent girls about the time of puberty there results, through changes produced by sexual instinct, by knowledge, and by discussion of the question, an indefinite attraction toward the genitalia which leads to onanie, which attraction is more intense and occurs earlier if the girl is hereditarily psychopathic. The local menstrual congestion plays a

rôle in onanie by producing hyperesthesia in the genitalia. The patients are pale, with tired expression of the face, dark rings about the eyes, dreamy in their movements, remain long in bed, etc.

A tendency to onanism is produced either from the periphery or from the centrum. The two forms are, first, peripheral and mechanical; second, psychic or thought onanie. In the peripheral form, onanie is produced by friction of the clitoris and vagina brought about in numerous ways. In the second form the orgasm is produced by central stimulation, by imagination and fantasy of a sexual, lascivious nature. In older individuals the sequelæ are fluor, menorrhagia, pain in one or both ovaries, pallor, hysterical symptoms. A neuropathic predisposition often plays a causal rôle. When this neuropathic tendency is absent, onanie only by excessive practice causes marked nervous disturbances. Lowenfeld says that the nervous annoyances resulting from onanie in a certain number of cases follow the sexual form of myelasthenia characterized by backache, hyperesthesia and paresthesia of the form of ovarie and pruritus vulvæ, increased frequency of micturition, coccygodynia, a feeling of weakness and cold in the legs and the occurrence of pollutions. In the course of time there occur symptoms of cerebral and visceral neurasthenia, such as headache, sleeplessness, palpitation of the heart, nervous dyspeptic symptoms, so that more or less the condition rises to the dignity of a general neurasthenia. In addition, various hysterical symptoms may be added to the neurasthenic annoyances.

NERVOUS ANNOYANCES IN PREGNANCY

The congestion occurring in menstruation is, of course, carried on continually through the period of pregnancy, and while there is no absolute rule in the matter, it is quite sufficient to increase the same tendency to annoyances as is observed in the congestion of menstruation. In addition to this, we must remember that the placental secretion is an added element present in the blood of the mother, and that it may, and does in numerous cases, add further annoying symptoms to the expected physical discomforts which generally accompany that state. The

feeling of nausea, the morning vomiting, the emesis, and the hyperemesis are all annoying factors associated with pregnancy, especially in the early months, and are in all probability due to or aggravated by the action of placental secretion.

Nervousness, nervous annoyances resembling "hysterical symptoms," chorea, etc., are recognized possibilities in the course of pregnancy. It is evident to every one that women with nervous symptoms are not infrequently made worse by the metabolic changes and the added placental secretion associated with gravidity. That women who are pregnant are liable, for emotional or other reasons, to the same general nervous annoyances as non-pregnant women are, is of course not to be controverted. On the other hand, many women feel better during, and especially after, a pregnancy than they did before. Even in pregnancy symptoms resembling hysteria or neurasthenia occur in women who formerly showed no evidence of these conditions, and it is quite possible that alterations in the relation between the ovary, the thyroid, and the placental secretion are responsible for these changes.

The proneness of women to gastro-intestinal derangement in connection with menstruation, pregnancy, and the menopause is well known. In each of these conditions digestive disorders frequently occur, with nervous accompaniments not unlike in nature to the incipient symptoms of Graves' disease.

We need only refer to the experiments which have been made on pregnant rabbits, showing that in them the nervous system is much more excitable than in rabbits not pregnant. The same sensitiveness of the nervous system is beyond doubt present at menstruation, and most assuredly is this the case during pregnancy. We here again repeat that, while the condition of pregnancy and its associated metabolic changes naturally aggravate nervous conditions, the nausea and vomiting of pregnancy are due to metabolic changes occurring in that state, and that among the causal factors is the irritating placental secretion.

THE RELATION OF PTOSES TO NEURASTHENIC SYMPTOMS

A large proportion of displacements of the uterus and adnexa, of chronic congestion and venous stasis in the pelvis, are asso-

ciated with "reflex" and constitutional symptoms. Not infrequently ren mobilis, gastroptosis, and enteroptosis are found coexisting. These patients often possess a flabbiness and lack of elasticity which is by no means the result of the gynecologic condition, so that *we are compelled to consider the latter as part of a general state.* From the gynecologic standpoint we name this local pelvic condition hysteroptosis. In addition to a *local genital subinvolution*, there is often present a *general constitutional subinvolution*, that is, a failure after labor in the return to the normal on the part of the various intra-abdominal ligaments, of the abdominal muscles, and of the general elastic and circulatory apparatus. Many of the symptoms due to such conditions in women are erroneously attributed to uterine versions and flexions, and to minor genital pelvic changes acting through reflex paths, and also to hysteria or neurasthenia.

A frequent obstacle in the proper care of these cases is the *firm belief on the part of many patients that a gynecologic trouble is solely responsible for their nervous condition.* It is certain that many women suffering from abdominal and pelvic ptoses are considered to be hysterical or neurasthenic or nervous. The symptoms of splanchnoptosis (Glénard) are: (1) debility and lassitude; (2) sensations of uneasiness, weight, dragging, craving, emptiness, etc., in the abdomen; (3) symptoms of dyspepsia; (4) nervous symptoms. The relation formerly considered to exist between ren mobilis and the general nervous condition of the patient is now recognized to really exist between a combination of abdominal ptoses and a general state. It cannot be said that abdominal and pelvic ptoses cause neurasthenia. It may be more justly said that neurasthenic women are prone to abdominal ptoses; that Glénard's disease and neurasthenia are sometimes combined. It can be said, however, that abdominal ptoses and pelvic ptoses are often productive of "neurasthenic symptoms," and that many patients suffering from abdominal and pelvic ptoses do have symptoms which, especially if the cause be not recognized, can readily lead to a diagnosis of hysteria or neurasthenia. One has only to consider the relief afforded by abdominal supports and by hydrotherapy as well as by local therapy, to see the relation which

these ptoses bear to symptoms often attributed to pelvic conditions alone or to neurasthenia.

Abrams has described a special form of nervous weakness designated as "*splanchnic neurasthenia*," which is characterized by paroxysms of depression of varying duration, and which are specified popularly as "the blues." Splanchnic neurasthenia is characterized by attacks of depression which come on spontaneously without apparent cause and depart as mysteriously as they came. Abrams believes an attack of the blues to be naught else but an acute neurasthenia, or a periodic exacerbation of chronic neurasthenia. He holds that many cases of neurasthenia have an abdominal origin, and that the neurasthenia may be referred to a defect in the nerve apparatus which controls the supply of blood in the abdominal cavity, and that this condition is eradicable by simple methods. He finds a large number of gastric and intestinal affections, with bizarre and protean symptoms, designated as gastric and intestinal neuroses, which in reality owe their genesis to the congestion of the intra-abdominal veins. The greater the intra-abdominal tension, the less bood will be contained in the abdominal veins. This tension is largely dependent on the tone or tension of the abdominal muscles. Therefore, nervous exhaustion is a frequent cause of diminished tone of the abdominal muscles, which in turn diminishes intra-abdominal tension and conduces to blood stagnation in the veins of the abdomen. The toxic products of digestion, which are normally removed by an unimpeded circulation, have a specifically poisonous effect on the sympathetic system, a fact which is evident, owing to the frequent occurrence of depression, prostration, and nervous symptoms in nearly all disorders of the alimentary canal. In his opinion the entire question of splanchnic neurasthenia is one of abdominal plethora, dependent on a variety of causes: notably, diminished intra-abdominal tension, insufficient lung development, a defective vasomotor apparatus. Splanchnic neurasthenia is one of the forms of neurasthenia amenable to permanent cure, by measures having for their object the relief of abdominal venous congestion.

DIMINISHED EXCRETION OF UREA

The amount of urea output in women is often below the normal. In such states various "nervous symptoms" are often present. W. H. Thomson mentions among the symptoms of deficient urea excretion, headaches, mental depression, severe neuralgias, constantly shifting from one part of the body to the other, all kinds of paresthesias, somnolence alternating with insomnia, and a sense of general prostration, especially in the morning, and also in some instances polyuria. Thomson says that these cases are generally diagnosed as hysteria or neurasthenia. A diminished output of urea is of no consequence, however, unless there is a corresponding increase in nitrogenous excrementitious materials in the blood. The non-protein nitrogen, urea nitrogen, uric acid, or creatinin in the blood may be increased beyond normal limits.

HYSTERIA

"Hysterical Symptoms."—Gowers says that the manifestations of hysteria may be divided into a mental state and into motor and other symptoms. There is defective power of will, imperfect self-control, inability to resist the impulses of inclination, irritability of temper, undue sensitiveness to annoyances, whereby trifling cares and vexations become grave troubles. Self-consciousness dominates the patient's thoughts and even her actions. Laughter and tears come readily. There is the globus hystericus. Such patients are characterized by variable moods, by emotional, excitable temperament. The patients are easily exalted and easily depressed; tears and laughter follow insufficient causes. There is unusual susceptibility to passing impressions of the moment. There is increased sensitiveness, hysterical tenderness, and neuralgic pain. There is hyperesthesia or lessened sensibility, often in the legs, with motor weakness. There are areas of anesthesia. The ovarian region is often sensitive, as is also the spine; there are palpitations, flushings of the face, vasomotor spasm, fainting, and vomiting.

The stigmata of hysteria are corneal and pharyngeal insensibility, areas of skin anesthesia and hyperesthesia, concentric

contraction of the visual fields, hysterogenic zones, convulsions. There is tenderness, either superficial or deep. The patient is generally aware of it, in contradistinction to anesthesia. There is tenderness often in the ovarian and infra-mammary regions, in the upper abdomen and along the spine. Patients suffer from dyspepsia, gastric pain, flatulence, diarrhea after eating, rapid action of the heart on the slightest emotion, with or without subjective sensation of palpitation.

Tremor may be present, which is fine and rapid, like that in alcoholism or in Graves' disease. There may be tachycardia with or without palpitation. There may be a persistent rapid pulse. *The differential diagnosis must be made from the irregular forms of Graves' disease.*

There is often irritability of the bladder, the patient sometimes voiding twenty to thirty times a day.

"The motor, vasomotor, sensory, and circulatory symptoms are related to emotional disturbances, alike in their commencement, course, and manifestation. They frequently follow mental shock, or are gradually evolved under the influence of more persistent emotional disturbances, and may be intensified from time to time under the same influence. Another characteristic is the mutability of symptoms, whereby grave troubles of one kind cease and give way to other symptoms, such as cannot result from the same organic causes as the first."

I accept Osler's view that hysteria is often diagnosed where there is really neurasthenia, and that in the absence of hysterical paroxysms, of crises, and of those marked emotional and intellectual characteristics of the hysterical individual, the diagnosis of hysteria should not be made. The tendency to hysteria is primarily an evolutionary defect. A marked constitutional hyperemia at every menstruation, severe dysmenorrhea, and long-continued pelvic pain are among the exciting factors which may bring on hysterical manifestations in predisposed individuals. Likewise, the preying consciousness of an abnormal pelvic condition, though in reality giving rise to no symptoms, may act as a psychic irritant. However, the causal relation of pelvic diseases to hysteria has been grossly exaggerated.

NEURASTHENIA

Nervous persons, says Clarke, are perhaps best distinguished from those not so disposed by a difference in physical reaction to external agencies; by a tendency to exhibit psychic disturbances on what appear to be inadequate causes.

Many persons possess a congenital peculiarity of nerve function, for which they may seek medical advice, but which is not really morbid. Such is the persistence of the "shyness" of early life, or a tendency, lifelong, to look on the darker side of things, or the vasomotor activity which causes so many persons, all through the first half of their lives, to blush on the least emotion and flush under every slight physical influence. In many cases of neurasthenia the condition is distinctly "constitutional;" that is, the defect in the nervous system is inherent in the individual, and a similar ancestral tendency can often be traced. It dates from childhood in some; in others it comes on after puberty or in early adult life, without any discoverable cause. Of the latter a large proportion are females, who are unable to bear even the average strain of life and break down in various ways. They may be raised to a little higher level of nervous health, but cannot be made really strong (Gowers).

Clarke defines neurasthenia as "a nervous disorder without any known alteration in organic structure, characterized by a persistent state of fatigue, and hence of weakness of the central nervous system, in the absence of the causes which normally are adequate to induce such fatigue, and at the same time by a loss of control on the part of the higher nervous centers, and hence by an excessive reaction in certain directions to slight irritations."

The cardinal symptoms, recurring in different combinations, and called by Charcot the stigmata of neurasthenia, are pains in the head, dizziness and vertigo, inability for mental work, various disorders of sleep, irritability of temper, weakness and tremor of the limbs, pains in the back, palpitation, certain forms of dyspepsia, sexual weakness, worry over trifles, loss of will-power, indecision, hesitation, insomnia. There may be tremor, which is fine, like that of Graves' disease, or slight twitchings of

the tongue and eyelids. Tenderness and pain are felt over the spine. The pulse in many cases is between 80 and 90, occasionally 100 to 120. *It is hard to make the diagnosis from the milder forms of Graves' disease.* Attacks of tachycardia occur after excitement or mental strain. There is dyspepsia or some form of gastro-intestinal disorder; flatulence or diarrhea or constipation. Glénard's disease is not often found. Irritability of the bladder and oxaluria are rather frequent. Weakness of the legs is common. There is often tremor in the legs, with a feeling of "giving way" at the knees. The patients have anxieties and fears.

Fatigue may be produced with undue rapidity by muscular exertion and by mental effort. Muscular strength is only lessened in the severe degrees of nervous weakness, but the power of sustained effort is generally reduced. Fatigue is not only sooner felt, but is often a more unpleasant sensation than the fatigue of health, and whatever pain or discomfort to which the sufferer is liable is apt to be induced. Often talking may cause a feeling of weariness and cephalic sensations to which the patient is liable. Many of the sufferers habitually talk in a low voice, as if every sentence involved an exertion almost beyond their strength. A sense of muscular inertia and powerlessness is very frequent, especially in the earlier part of the day, when there is no real lack of strength. The least effort, indeed, for any exertion may seem beyond their power. The frequency with which the gynecologist is confronted with symptoms of neurasthenia makes it imperative that he have a clear conception of the relationship of these nervous phenomena to the conditions which he is called upon to treat. It takes more than a few "neurasthenic symptoms" to constitute the clinical entity neurasthenia. Anemia, onanism, pregnancy, the puerperium, lactation, the climacterium, are contributing factors in producing neurasthenic symptoms. Unless associated with continuous loss of blood, or with long-continued pain, I do not believe that pelvic diseases, viewed as local conditions, are responsible for the development of the essential neurosis, neurasthenia.

REFLEX NEUROSES

A subject which is of great interest in gynecology is the question of reflex neuroses.

There is a tendency to refer many or all of the nervous symptoms, especially in married women, to local disturbances in the genital tract. Prolapsed ovaries, cystic ovaries, lacerated cervices, anteflexions, and especially retroversions and retroflexions, are accepted as the etiologic causes, through reflex channels, of many and numerous nervous symptoms. We find many observers who attribute to reflex channels the etiology of symptoms, while others consider the association of pelvic lesions and general nervous symptoms to be a coincidence, while still others consider the local lesions as the exciting cause in predisposed individuals.

Numerous women bear children, work hard, and never have physical or nervous annoyances at any period of their lives. We know others who, for causes mainly inflammatory and circulatory, have constant physical pelvic disturbances without nervous manifestations. We see many women who, combined with these local pelvic disturbances, evince nervous phenomena of greater or lesser variation. Another large class is formed of those who, without local tangible pelvic changes, have nervous annoyances of a greater or lesser degree.

W. H. Freund speaks of the "predisposition of sex," and says that we must seek in local processes, in disturbances of nutrition, and in the variations of metabolism the elements productive of nervous annoyances. General disturbances of nutrition, as they occur in women's diseases, furnish a high degree of predisposition. Chlorosis and anemia are factors of importance. Menstruation, labor, subinvolution, loss of blood and secretions, poor digestion following severe diseases, cachexia, and early senescence are also to be mentioned. "All these factors may produce nervous annoyances or serve as the agents predisposing to neurasthenic and hysterical symptoms."

Freund recognizes a strong predisposition in these mentioned changes, and in direct injuries, in inflammatory changes and infections of the genitalia, in sexual overexcitement, in atony of

the pelvic and abdominal organs. Of importance, in addition, is hereditary tendency, congenital irritability of the nervous system, unsuitable education, and psychic changes.

The diagnosis of pelvic abnormalities as the cause of pain elsewhere produced through reflex is to be made with care. Many general conditions are to be looked for. A thorough examination often shows hysteroptosis, enteroptosis, gastroenteroptosis, ren mobilis, etc., to be responsible for many annoyances attributed to uterine malpositions, to cervical lacerations, etc. Many women have pelvic pain due to unrecognized parametritis, to slight degrees of salpingitis, peri-oöphoritis, etc. Many suffer from rheumatism and auto-intoxication. Headaches and neuralgic pains are frequently due also to nodules and deposits in various parts of the body which may be removed, to the vast benefit of the patient, by persistent massage. Many suffer from backache because of enteroptosis or hysteroptosis, or parametritis or pelvic congestion. Women often have annoying symptoms, which arise from a faulty and diminished excretion of urea or are due to lithemia. This extremely important condition in women should always be looked for. Further, an abnormal retention of urea in the blood is productive of many nervous symptoms.

I do not believe that those anatomic changes in structure which do not cause pain can be considered as factors by way of reflex in the causation or accentuation of nervous symptoms. Attention is due cases with actual lesions of importance in the genital tract. *We must grant that inflammatory changes of minor or severe degree which cause marked or protracted pain can readily wear down the nervous system.*

"It is not always easy to decide whether, in conditions occurring at the same time in different parts of the body, there exists an accidental coexistence or a causal relation. In general, one thinks first of a connection by means of the cerebrospinal or sympathetic nerves," in spite of the fact that to these, as W. H. Freund says, there falls an inferior rôle. The relation of the internal secretions to the nervous system is far more important.

He, however, believes that irritation of the nerves of the genital organs by palpable nodules, sclerosing connective tissue,

an inflammatory focus, a hemorrhage, give rise to reflex symptoms. The paths through which such lesions act reflexly are the spinal cord and the cerebrospinal fibers, but especially the sympatheticus, by which the genital system is richly supplied. In parametritis chronica atrophicans, severe perineuritis and neuritis of the nerve-supply situated in the broad ligament have been found. Freund considers this condition as an established basis of hysteria and says that where this condition is present hysteria is never absent. He defines hysteria as "that disease in which there is clearly noted, coming out from the diseased area, and also called forth by examination, reflex neuroses, which, according to their place of manifestation, must be called sympathetic, or spinal, or cerebral. To this neurosis, sooner or later, is added a psychic reaction, differing according to constitution, inheritance, and 'bringing up.'" We see here a definition of reflex etiology not in keeping with the generally accepted understanding of hysteria pure and simple, a definition with which I do not agree.

In the discussion of Freund's views the following opinions have been expressed.

Bröse says that in cases of severe hysteria he finds, in almost all of them, parametritis atrophicans. He makes the diagnosis through the stigmata of Charcot. One patient, with all the objective and subjective symptoms of hysteria and hysterical delusions, had parametritis atrophicans. In a second case he did a ventrofixation, and the local and hysterical symptoms disappeared, although for weeks after the operation the patient suffered from hysterical vomiting. There are many patients who have hysteria with objective symptoms, even after the correction of the displacements. The reflex neuroses of a retroflexion have, in his opinion, nothing to do with hysteria. Chronic adnexal troubles, without parametritis atrophicans, do not cause hysteria. He believes chlorosis to be a cause of hysteria, and considers hysteria a secondary condition, and not a true psychosis.

Olshausen says that hysteria is a psychosis, and that reflex neuroses do not constitute hysteria. There are, however, certain local lesions which do cause this condition, and he

mentions the case of a girl twenty years old with severe hysteria and epileptiform attacks occurring every night at 8 o'clock. In spite of isolation and various attempts to deceive her as to the time of day, the attacks occurred regularly at the same hour, and he removed her ovaries and the patient became well. He believes that faulty training of wilful children, especially where the conduct of the child has been poorly controlled, is often the cause of hysteria appearing at puberty.

Koblanck says that he sees many neurasthenias, but few hysterias. He believes that sexual disturbances are a frequent cause of nervous conditions.

Mackenrodt finds the most important cause of neuroses in the field of the sexual organs. He had a case like Olshausen's, which was cured by operation, and stated that Sänger made the same observation in many cases in the Leipsic Insane Asylum. Mackenrodt finds with Freund's disease many neurasthenic symptoms. The local condition acts for years, until a strong psychic irritation occurs and then a psychosis results.

Shaeffer finds that retroflexion, combined with ren mobilis, enteroptosis, and loose abdominal walls, are closely related, etiologically, to psychic conditions. In his opinion, all chronic gynecologic troubles, especially inflammatory, may give rise to hysteria.

Lippmann says that hysteria is a disease of the central nervous system, which in predisposed cases can be started from various peripheral parts of the body, through various conditions in those parts, most frequently from the genital system, and sometimes from the ovaries. He refers to a case of hysteria in a girl who menstruated at twelve, with pain in the ovarian region. He mentions the fact that for the first year and a half of the disease the attacks followed a monthly type and then became general. She then developed fibrillary twitchings, temporary contractures, convulsions, and finally opisthotonos of long duration. She was operated on by Schroeder at the age of twenty-six. One ovary contained a dermoid, the other was cystic. The attacks stopped, and in four years she was well.

Steffeck believes in various causations. He does not think that gynecologic troubles are the cause of hysteria, but holds

that in *the hysterically predisposed individual, through auto-suggestion or ecto-suggestion, there develops the idea that there is a definite area, an injured spot, which produces the hysterical symptoms. Steffeck terms them, if they are to be regarded as hysteria, "local or localized hysteria."* He believes hysteria to be a true psychic disturbance, through inherited or acquired sensitiveness, as a result of which a pathologic reaction occurs, with the most varied injuries. He believes that faulty education, disturbances of adolescence, uncongenial marital relationship, etc., are important points in the causation of hysteria.

Strassmann is very careful in the diagnosis of hysteria. He believes that nervous symptoms may be produced by abnormal sexual relations, not alone physical, but also mental—coitus interruptus, masturbation, marriage with impotents, and in women not happy in a sexual-ideal way in marriage, women who feel themselves neglected, etc. He does not accept Freund's etiology.

Gottschalk says that not every hysterical symptom makes a hysteria, and he speaks of a reflex hysteria and of a central hysteria. Peripheral lesions may reflexly cause a hysterical picture, but these cases are far in the minority. He believes in the element of heredity, and when an irritating cause appears, a hysteria develops. Among the irritating causes are marriage with impotents, masturbation, and coitus interruptus.

I believe that the views of Strassmann and Steffeck are the correct ones, and that they dispose, to a great extent, of reflex neuroses and bring us to a realization of the fact that incessant pain and mental perturbation act sometimes without injury and sometimes with injury, upon the nervous system of the female, *according to the predisposition of the patient.* We can see here the great difference in opinion as to the etiologic relationship between gynecologic conditions and nervous symptoms. That most of the cases considered to belong under the head of hysteria are really "neurasthenic" is certainly true. We should not attribute to purely local pelvic conditions not associated with pain the causation of neurotic and psychic phenomena.

The reaction and mutual relation between physiologic functions and altered activity of the ovaries, on the one hand, and the general organism, on the other, must be considered. We not only need an anatomic knowledge of the genital system and its diseases, but must also observe the influence of genital and sexual development on the general female organism. We must study the relation of normal and altered ovarian and thyroid activity on the psychic and physical characteristics of women. The first onset of menstruation, the period of complete development of the sexual organs, the elements of sexual relation, conception, pregnancy, labor, puerperium, and the retrogressive changes involved in the climacterium and the cessation of menstruation cause physiologic processes and pathologic changes in various endocrine glands and in the general nutritive condition; in the function of the heart and circulation, in the ovaries, nerves, skin, mind, digestion, and metabolism.

Modern culture and social conditions have an unfavorable influence on the sexual organs of women, which finds its expression in the great frequency of gynecologic diseases. Faulty training and manner of life lead to violations of nature's laws, and to injuries in the genital sphere. Even before complete puberty the phantasy of young girls is directed to the sexual processes by improper books, by plays, by social intercourse with men and women whose conversation and bent of mind are not clean and wholesome and by the abnormal "sex literature" called Freudian. The growing girl recognizes at puberty the meaning of sex; the developing woman feels an attraction to sexual gratification. Though the desire for children varies in degree, the sadness of sterility is often a tragedy. The influence of maternity and pregnancy is of much psychic importance. The period from puberty to marriage may be influenced too much by the awakened sexual inclination. Inactive life, improper nourishment, and the early use of alcoholic drinks influence the psyche during this period and tend toward the development of the neurasthenic state. Late marriage furnishes an individual too well informed in sexual matters, and often one weakened and nervous through

sexual longings and stimulations (Kisch). Sexual intercourse, with the accompanying methods of preventing conception, has a bad effect on the nervous system and the genitalia of women. Actual or relative impotency of the husband, failure to show kindness and consideration, are productive of neuroses. The congestive influence of the ovaries, and the relation of the ovaries to the thyroid pitiutary and adrenals, produce marked changes in the genitalia and the genital sphere.

CARDIAC PHENOMENA ASSOCIATED WITH SEX FACTORS

"Every phase in the life of a woman, closely related as it is to the periodicity of the feminine sexual functions, beginning with the onset of menstruation and continuing on through wedlock to the disappearance of sexual activity in the climacterium, may give rise to heart symptoms. The heart annoyances which are associated with the normal processes and regressions occurring in the female genitalia may be dependent on neurasthenia or hysteria, or hereditary taint, on the basis of which neuroses of the heart develop. The occurrences in the sexual apparatus thus furnish the exciting factors. Ofttimes abnormal practices in the sexual sphere in the unmarried or the wedded, the exercise of the normal functions against one's will or inclination, or with an unsuitable partner; marriage to an impotent may exercise a powerful influence in starting neuroses or functional phenomena with associated cardiac annoyances."

Heart symptoms at puberty may develop for weeks or months before the first period. There is often an increased objective noticeable palpitation, at times associated with vasomotor sensitiveness, blushing, tendency to pallor, tendency to fainting. There are cases where the pulse may beat 120 to 140. The symptoms usually occur in attacks, sometimes daily, sometimes at intervals of several days. When the period begins the attack disappears, usually recurs at the following periods in milder form (hyperthyroidism?) Kisch describes paroxysmal attacks of tachycardia with very rapid pulse, which occur sometimes before the first period, and then each time before every following period, and may last several months after the establishment of regular menstrual periods. These cases show an increased irritability of the sympathetic. In them there is neither

anemia or chlorosis. In certain cases the above-mentioned heart symptoms and vasomotor disturbances occur before each period. Noticeable irritability of the heart at the time of menstruation is observed in most girls suffering from hyperthyroidism. The thyroid is then swollen.

It must be remembered that the heart reaches its greatest increase in size at puberty. In nervous girls, especially with severe annoyances, before the occurrence of genital bleeding, the increase in pulse is more noticeable, and may be associated with palpitation. On the occurrence of bleeding the pulse returns to the normal, unless there are attacks of dysmenorrhea. In all cases masturbation must be considered as a possibility in the production of the palpitation or the nervous phenomena, or the congestions in the pelvis, which may be responsible for genital excitation or dysmenorrhea or menorrhagia. Entrance into the climacteric stage is often associated with numerous psychic disturbances, nervous unrest, fatigue, weakness of memory, no desire for exertion. In patients with neuropathic tendency the climacterium may start various psychoses. "Those patients suffer psychically in whom, as the result of a rush of blood to the pelvis or congestion in the pelvis, there is a feeling of weight and discomfort, and where frequently sexual excitement occurs, especially if not gratified." Attacks of tachycardia are sometimes very annoying. It is certain that there is a close connection of such vasomotor symptoms with the processes of involution in the genital tract, especially with the failure of the ovarian secretion in nervous cases and sexual cases. There is often an increased libido sexualis. The libido sexualis, for the greater part, no longer needs a peripheral physical stimulus. It is strengthened by memory pictures, and for that reason may persist a long time.

Many cardiac neuroses are due to abnormalities in the act of cohabitation. Cardiac pain and palpitation are often present without any evident cause. Herz of Vienna studied the consequences of abnormal sexual relationship. Coitus interruptus and abnormal coitus, incomplete coitus, etc., leave the participants dissatisfied, nervous, irritable, and in a state of mental unrest, because their sexual inclinations are diverted from the

natural course of progression, which is absolutely essential for the complete satisfaction resulting from the normal use of this function. The two important symptoms are: (1) pain, generally below the mamma, stationary and which accompanies deep inspiratory effort, variable in intensity and duration; (2) palpitation of the heart, a common symptom, which is always subjective. The subjective complaints may consist of simple heart consciousness and are not aggravated by exercise. Auscultation is negative. Sleep is restless, and is usually disturbed by dreams of persecution or of a sexual character (J. Gutman).

This occurs because of incomplete or abnormal coitus. It may occur in ungratified individuals. It also occurs in unfortunate matings, whether the result of age, habit, or passion. It should be considered wherever there is a suspicion of unsatisfied longing. It is always possible in many of these cases that the thyroid or the isthmus are enlarged. How much hyperthyroidism has to do with many of the cases must be a matter for consideration in each individual case. That this is very often true must be recognized from the effect which sexual conditions are known to have in Basedow's disease.

Palpitation, associated with dyspnea, headache, dizziness, heart pain, may be associated with coitus. These annoyances may result from continued *congressus interruptus*. The important thing is the impossibility of a normal ending of the orgasm. There may be added neurasthenic symptoms, especially of a depressive nature. Finally, tachycardia, dizziness, weakness, precordial anxiety, may occur independent of congressus. There may also be backache, a feeling of drawing and weight in the pelvis, which may extend into the legs, together with objective symptoms of hyperemia of the genitalia.

"In individuals castrated during the early years the libido sexualis does not exist unless there has been a preceding somatic psychosexual puberty. Has there once been an awakening of the sexual desire or instinct, or has there occurred the actual experience of it, then the memory picture obtained thereby (the so-called libido centralis) works against the disappearance of the sexual desire after castration. For this reason, the majority of cases of castration find little difference in libido."

The Freudians believe in the paramount importance of the sexual factor in the psychoses and neuroses, and they explain this great importance by the equal importance which the sexual plays in the mental life of every individual. Every dream is said to contain the hidden fulfillment of a repressed wish, which is usually referred to the two great impulses, hunger and love.

We wish to state here that we deplore very decidedly the present day broadly spread acceptance of these ideas. We believe that the relation of the "sexual factor" as a causative element in the neuroses and psychoses has been tremendously exaggerated and erroneously interpreted.

Every child is an egoist and a sensualist during a period before clear thought begins and verbal language is used. Every child occupies himself in dealing with a body of sensations, some of which he finds strangely pleasurable and longs to reproduce (Putnam).

"Dreams are representations of suppressed impulses. The dreams of children, and many dreams of adults, are frankly sexual, but their suppression is usually so vigorous that one's natural desires are not permitted to express themselves even in dreams. If the suppressed desires could so disguise themselves that they did not shock us, they could often succeed in presenting themselves to us. This is the origin of symbolism in dreams. The impulses which seek to express themselves through this symbol will always be of two kinds—*wishes or fears.* Dreams represent the working out of unfinished problems" (Scripture).

Goodhart believes that the interpretation of dreams by symbols may be productive of much harm. Phallic symbolism may be only suggested to the patient by the interpreter and thus a trend of sexual subjective associations is begun. How many symbols are truly phallic to the dreamer; how many are suggested to him by the interpreter?

ABERRANT BASEDOW'S DISEASE; HYPERTHYROIDISM

Among the symptoms of Basedow's disease are: tachycardia, palpitation, nervousness, weakness of the lower extremities, weakness of the voice, depression, changes of disposition, headaches, vertigo, insomnia, disorders of the stomach

and intestines, itching, vesical irritability, all the symptoms intensified in the morning, sensation of so-called inward trembling.

Functional derangement of the nervous system occurs in Graves' disease with a greater variety in the individual symptoms than in any other complaint, not excepting hysteria. The nervousness has much the character of mental agitation, not unlike that accompanying a sense of fright. With some it takes the form of pure depression of spirits, worse in the morning. McCallum says: "Early in the disease the patients feel themselves to be irritable and excitable. Their friends observe a change in disposition very different from that observed in the development of myxedema. Instead of becoming sluggish and apathetic, with all the mental faculties dulled, these patients are occasionally susceptible to every outward stimulus, and the mental reaction is a relatively intense one. In some respects this receptive and reactive state may resemble in a mild way that seen in the maniacal stage of the maniacal-depressive insanity. A feeling of anxiety dominates the mental state and the patient becomes the prey of groundless fears. Insomnia may be persistent, much to the exhaustion of the patient."

Möbius says of Basedow's disease: "Beside the picture rich in symptoms stand the aberrant forms, in which often only some few symptoms are demonstrable, and probably the extent of these aberrant forms is much greater than is generally supposed."

When the typical symptoms of exophthalmos, goiter, tachycardia, and tremor are present, a correct diagnosis is, of course, readily made. This grouping of typical symptoms is by no means always present. There are many cases of Basedow's disease without exophthalmos or without goiter, or without either. This point is important, because it facilitates a correct diagnosis of many cases of ill health, the true nature of which is often not suspected. These patients, as W. H. Thomson says, are rated as hysterical, neuralgic, neurasthenic, rheumatic, or dyspeptic.

"Recognition of the fact that Graves' disease may occur without exophthalmos and without goiter will result in the proper treatment of the numerous class who have Graves' disease only in an incipient or mild form, characterized by dyspeptic symptoms with headaches, neuralgias and nervousness, and persis-

tent tachycardia" (Thomson). Yet even tachycardia is not always present.

There is a marked resemblance existing between "hysterical symptoms" and "neurasthenic symptoms" and those symptoms belonging to mild or aberrant forms of Graves' disease. These conditions must be differentiated from the irregular forms of Graves' disease. It is certainly difficult to make this differentiation from the milder forms. In those cases of Basedow's disease in which the typical symptoms are absent it is more than probable that the diagnosis of hysteria or neurasthenia is frequently made.

THE CLIMACTERIUM

A slight change in the sensitiveness of the vasomotors is a physiologic accompaniment of the climacterium. In association with the various forms of climacterium heart symptoms the vasomotor symptoms never fail. Flushes followed by pallor, perspiration, spots before the eyes, dizziness, tendency to fainting, buzzing of the ears, may in some cases cause an irritability of a general nature with manic and depressive symptoms. Those patients suffer psychically in whom, as result of a rush of blood to the pelvis, there is a feeling of weight, discomfort, and frequently sexual excitement. Attacks of tachycardia are sometimes very annoying. It is certain that there is a close connection with the processes of involution in the genital tract, especially with the failure of the ovarian secretion, as an explanation for the climacteric heart annoyances. It may not be this alone; there may be changes in other glands with an internal secretion.

Generally at the forty-fifth year, entrance into this stage is often associated with numerous psychic disturbances, nervous unrest, fatigue, weakness of memory, and antipathy to exertion. In patients with neuropathic tendency the climacterium may induce various psychoses. There is often an increased sexual desire. The libido sexualis no longer needs a peripheral stimulus, but is strengthened by memory pictures, and for that reason may last a long time. A very frequent early symptom is numbness of the arms and legs. Many women complain of rheumatic or gouty pains in the extremities, back, and sacrum,

which are etiologically connected with the diminution of the genital function (pseudo gout). At this time there may occur changes of the skin, pigmented spots on the face, growth of hair on the upper lip, the growth of warts, occurrence of arthritis deformans. We must not overlook the Heberden nodes, small nodules up to the size of a pea, found especially on the proximal area of the last phalanges.

In the climacterium the woman recognizes her diminished sexual value. In the period of full development of genital life the sexual instinct expands, the instinct for conception and propagation rises to full heights, and after the period of cohabitation and activity there comes a period of rest, diminishing down to passiveness. At the pre-climacteric period and in the beginning of the climacterium there is awakened desire and increase of the libido sexualis. Certain pathologic symptoms which appear at the period of the establishment of menstruation, and which diminish or disappear from the field during the period of regular sexual function (such as heart annoyances, dyspnea, psychic neuroses, chlorotic states, albuminuria, skin lesions, etc.), arise again to full force at the time of the climacterium. In fact, so certain is this condition, according to Kisch, that *the character of the climacterium may be fairly well predicated from the peaceful, the irregular, or the disturbed general condition which existed at the period of puberty and the establishment of menstruation.*

Healthy women who lead a wholesome life, who are well nourished and free from distressing influences as girls, who practise normal sexual relations, possess a longer period of genital life than women in opposite conditions. It is a sign of decadence when the well-to-do classes evidence a short duration of the sexual life. Hygienic and ethical life is associated with lengthening of life as a whole, as well as with the lengthening of the sexual activity of women. The failure of culture and ethics brings a shortening of the period of sexual power. This holds true for the individual, for the family, and for peoples. Healthy women whose sexual organs are functionating normally, who have borne several children, who have nursed them, usually have a longer duration of the menstrual function than those under

contrary conditions. Weak, debilitated women have a shorter period of sexual life. Mental irregularities and annoyances occur as a result of the early disappearance of the menstrual function. Chronic inflammatory diseases of the uterus and adnexa shorten the length of the sexual life.

Many patients with nervous symptoms come into the hands of the gynecologist at that period of life which closely approximates the time of normal menopause or climacterium. They are ceasing to menstruate, either gradually or suddenly, and attention is naturally directed to the possible arrival of the critical period known to the laity as the "change of life." When, however, patients of this kind are still menstruating, or are menstruating more profusely than usual, the menopause is often not sufficiently considered. On the other hand, this is the period in which various conditions are prone to produce not so much hysterical as neurasthenic symptoms. In many instances the symptoms are not those of the supposedly typical climacterium, and for that reason a differential diagnosis is infrequently attempted. We find at this period of life two classes of cases: those which may be appear excitable, and cases which may be considered as melancholic or depressed. Those of the excitable class conform more closely perhaps to the usual picture associated with the change of life. It must be noted that after castration the same division into two classes is observed: (1) the excitable, and (2) the depressed. In not all instances are the vasomotor symptoms present, nor are palpitation and irritability always observed. It is certainly easy in the form associated with depression to make the diagnosis of neurasthenia or nervous prostration. Although at this period of life, and perhaps more so than at others, true neurasthenia does occur, nevertheless many of these cases are probably such as are produced by a diminution of the ovarian function. The frequent development, in the predisposed, of a true psychosis at this period must not be forgotten.

According to Fehling, the evidences which accompany a natural menopause are congestions, flushes, sweatings, which have a tendency to disappear after one-half to one year; they sometimes last for years. There may be superimposed

palpitation, dizziness, stomach and intestinal annoyances, a feeling of flatulence and distention, neuralgia, especially costal, sleeplessness, an anxious feeling, mental unrest, nervous irritability.

It is important again to mention the fact that cessation of the menses is generally considered an essential evidence of the climacterium. This is an erroneous idea. One of the important complications of the climacterium is excessive uterine bleeding, regular or irregular in its occurrence. With these bleedings the essential constitutional and nervous symptoms of the climacterium may be present, even if not to the fullest extent. Because of the presence of the bleedings, the other climacteric symptoms are frequently disregarded, because of the prevalent idea that only a cessation of menstruation is proof of the onset of the climacterium.

During the natural climacterium the annoying symptoms are generally worse in those patients in whom atrophic changes in the uterus occur rapidly, while they are less annoying if these changes go on slowly. The patients who have irregular and profuse bleedings often, but not always, suffer less from the annoying constitutional and nervous symptoms.

Castration.—That the ovarian secretion is not always of essential importance is evidenced by the fact that a goodly proportion of women go through the menopause without noticeable disturbances, and that a large proportion of the post-operative cases have little or no annoyance. The same variation in degree, in intensity, and in the duration of symptoms as is observed in the natural climacterium is likewise observed after surgical castration. The disturbances after operation are at first mainly of a vasomotor nature, and are accompanied by psychic unrest.

According to Martin, the symptoms after castration are rushes of blood to the head, combined with a feeling of anxiety. There is often added thereto palpitation, dizziness, tinnitus, sweating. These symptoms occur in various combinations, often repeated several times a day. Continuation of these conditions leads to a feeling of weakness, to headaches, sleeplessness, etc. The symptoms usually improve after two or three

years, but sometimes continue for five or six years. These disturbances result from absence of the ovarian secretion.

After surgical castration, even in the severe cases, the individual eventually becomes accustomed to the absence of the ovarian secretion, probably through atrophy of the thyroid. The fact that many cases have few or no symptoms at all shows that the same variations are observed after castration as are noted in the ordinary menopause.

Glaevecke says that castration develops an artificial climacterium, which in all points resembles the natural, and the female enters through the castration prematurely into the climacteric stage. "Castration cuts deeper into the general organism of the female than does total extirpation, and we must rate the mutilating effect of the first higher than the latter. Very noticeable are the changes in the mental sphere, where we generally see a depression of temperament, which is often increased to marked melancholia, and in these cases may go on to a real psychosis."

On the other hand, Pfister claims that "the so-called mutilation (of castration) should not be rated so high, in that the influence which the female ovary exerts on the female organism is much overrated."

Altherthum, too, says: "The complete removal of the ovaries does not at all produce the injurious results upon the mental and physical condition of the female that have been generally accepted."

Abel says that "after removal of the uterus the ovaries enter into a more or less rapid atrophy, which causes, before the age limit of the natural climacterium, a complete disappearance of ovarian function. It is certain that after removal of the ovaries we see at once all the physiologic accompaniments and anatomic consequences of the climacterium developing in a relatively short time, more immediately and sharper than they generally take place at the natural age limit. This is not so after the removal of the uterus alone. Here the transition is more natural and milder."

The symptoms which may occur with either natural or artificial menopause are mainly the following: (1) flushes, with

or without reddening of the skin, frequently followed by a sensation of cold and sweating; (2) palpitation of the heart; (3) dizziness; (4) headaches; (5) sleeplessness; (6) disturbances of digestion; (7) irritability of temper; (8) tendency to either mental depression or excitement; (9) various "nervous" manifestations, especially psychic unrest; (10) psychic disturbances.

According to Baruch and others, the annoyances after castration are most marked in nervous and hysterical women. They find it hard to distinguish in such patients between their former "nervous symptoms" and those which are due to the menopause.

Mainzer, in the clinic of Landau, found that disturbances in the vasomotor system resulting after castration disappear upon the administration of ovarin; that disturbances at the natural climacterium are benefited; that the results in primary or secondary amenorrhea are satisfactory, but that no effect is exerted upon general hysteria.

Theory of the Climacterium.—In the study of the symptoms of the climacterium, either natural or artificial, I have long been accustomed to consider many of these cases as instances of what I have termed "relative Basedow's disease," because the symptoms resembled to a considerable degree the symptoms of Basedow's disease. The more important reason was the fact that I considered the symptoms of most of the climacteric cases to be due to relative hyperthyroidism. Since Basedow's disease is considered to be due to hypersecretion of the thyroid, the term "relative Basedow's disease" seemed an apt one.

It is certainly remarkable that the great majority of cases of well-defined or aberrant Basedow's disease are observed in women. To say that an affection of the ovaries is in a degree responsible for the genuine cases would be going too far. The least that we can say, however, is that women are extremely prone to morbus Basedowi, probably because they possess ovaries.

If cessation of ovarian secretion means unopposed thyroid activity, as seems evident from the symptoms occurring at the menopause and after castration, there is no reason why disturbances of function on the part of the ovaries may not be

responsible for forms of "relative hyperthyroidism" and "relative Basedow's disease."

When the ovaries are removed at operation, the vasomotor and other disturbances which come on resemble more the symptoms of hyperthyroidism than any other condition of which we have any knowledge. *In women who have not been operated on, in women at menopause or climacterium, and often in women who are not near the menopause age, we frequently see annoyances of the same nature, often combined with scanty menstruation and with the other evidences of ovarian insufficiency.* Are we not justified in considering the relative oversecretion of the thyroid in them, too, as the pathologic basis?

According to Welles, the close relation between the thyroid and the reproductive functions is beyond question. The points in favor of these are the following: (1) the greater size of the thyroid in females; (2) the enlargement of the thyroid in menstruation and pregnancy; (3) the tendency to develop goiter during pregnancy; (4) atrophy of the thyroid soon after the menopause; (5) loss of sexual appetite in many of the thyroid diseases; (6) 80 per cent. of all goiters, 80 per cent. of myxedemas, and most cases of Graves' disease occur in the female; (7) Halsted observes that bitches that have lost part of their thyroids, when impregnated show evidences of athyreosis as the time of parturition approaches, which disappears soon after the litter is born; (8) all of the pups of these litters have thyroids many times the normal size; (9) "even in dogs, if they are old, thyroidectomy is neither fatal nor accompanied by the usual symptoms; Kocher points out that postoperative myxedema scarcely occurs at all in elderly people" (Thomson).

Thomson explains the frequency of Graves' disease in women "by the proneness of women to gastro-intestinal derangement in connection with menstruation and pregnancy and menopause." In our opinion it is just at these three stages that ovarian inactivity or insufficiency and ovarian relation to the thyroid would produce the annoying combination of nervous symptoms easily mistaken for hysteria or neurasthenia and resembling or actually representing aberrant forms of Basedow's disease.

Even if Thomson is correct in his statement, we must still determine what makes women prone to gastro-intestinal disturbances in connection with menstruation, pregnancy, and menopause. May not the tendency to gastro-intestinal disturbance be the result of the metabolic changes which occur at menstruation, pregnancy, and menopause? And if they are the result of the metabolic changes, then what more rational explanation have we than that ovarian and thyroid interrelation, always of a fluctuating rather than of a stable character, produces through hyperthyroidism and also hypothyroidism not alone annoying nervous symptoms, but innumerable variations in the severity of the symptoms?

Perhaps in the climacterium the annoying nervous symptoms are less if the thyroid atrophies coincidentally with the ovaries, and perhaps the symptoms are more annoying if the thyroid atrophies more slowly than the ovaries.

Perhaps in the climacterium the excitable cases are those with too much thyroid, and the depressed ones those with too little.

Possibly after operations the thyroid atrophies on absence of the ovaries, quickly in some cases and slowly in others, as probably happens at the normal climacterium. The patients grow stout, probably because the ovarian, and later the thyroid secretion, no longer stimulates tissue metabolism; in some cases possibly because the thyroid secretion being diminished or non-functionating, there is a "relative myxedema."

The probabilities are that ovarian insufficiency in many cases means relative hyperthyroidism. The least we can say is that the symptoms resulting from diminution or absence of ovarian secretion, and the symptoms of hyperthyroidism, are sufficiently alike to express the opinion that they are one and the same.

Administration of Thyroid Extract.—It is of interest to follow the action of thyroid extract, particularly in patients who have lost both ovaries at operation. Among such cases there are those who suffer absolutely nothing annoying after the castration. There are others who suffer in a mild degree and others in a very marked degree. In administering thyroid

extract to some of these patients, I have observed that in the first class there are produced some flushes and some irritability, but no marked results. In the second and third class of cases, each and every one of the annoying symptoms is markedly increased. So noticeable is the sensitiveness to thyroid, and so marked is the increased severity of the symptoms, that one can scarcely doubt that hyperthyroidism is the cause of the symptoms in the first instance.

On the other hand, the moment the thyroid extract is stopped and the patients are again put on ovarin, the annoying symptoms cease and almost entirely disappear. I have administered ovarin and followed its action in over forty cases of double oöphorectomy, with or without loss of the uterus, and have in only two cases failed to observe an almost entire absence or disappearance of annoyances, especially if the ovarin was administered soon after the operation. On the other hand, I have not been able to secure the same brilliant results by the administration of ovarin in cases of natural menopause or climacterium, as have been published by other authorities. Yet I have seen enough of its beneficial, though slower, effects to feel satisfied of its specific action.

After castration the reduction of oxygen exchange amounts to 20 per cent., the general gas exchange being likewise diminished; the weight, as a rule, increasing. The effect of ovarin, if given within two or three months after castration, not only overcomes this change, but increases the gas exchange above the normal, this increase lasting a variable time and diminishing gradually. On normal animals no effect is observed. The use of preparations obtained from the male organs exerts no effect on the female deprived of ovaries.

We must remember that ovarian extract has the effect of increasing oxidation, and perhaps of increasing the elimination of waste products, and the good results might be explained on this ground, were it not for the specific action of ovarin when administered after castration. Thyroid extract, as is known, increases oxidation, and especially aids elimination, and produces marked metabolic changes. This may account for the good effects obtained by the administration of thyroid, even

in certain conditions in which one would naturally expect thyroid to act injuriously. Good results have been published very generally on the administration of thyroid in simple struma. Many have published good results from the administration of thyroid in Basedow's disease, and, as is well known, numerous cases of obesity react beautifully to the careful administration of thyroid extract. On the other hand, several exact observers, while acknowledging the value of thyroid extract in simple struma and obesity, have noted absolutely no beneficial influence in cases of Basedow's disease. Most of us know that thyroid extract almost always increases the annoyances associated with exophthalmic goiter. The beneficial effect of thyroid extract in certain mental diseases is explained on the theory that the metabolic and other changes which it produces in the brain cause a reaction, which in some instances is beneficial. On the other hand, as might be expected, numerous cases are uninfluenced or harmed thereby, especially if in them the element of hyperthyroidism is present.

Hypothyroidism.—Neurotic symptoms are often suggestive of myxedema and are curable by thyroid. In myxedema patients are depressed almost to the verge of melancholy, without the self-accusation and despair of true melancholia. They are sluggish in their thought, unable to remember recent events, indifferent to their surroundings, without interest in personal and family affairs. They take an unfavorable view of their own condition; their will power is impaired. There is a mental inertia; they are inclined to be sleepy, and often sleep heavily both day and night, and awake without any sense of refreshment.

Physically there is a dryness of the skin and hair; the skin does not perspire, it becomes pigmented; the hair falls out or becomes gray. The surface of the body is cold; the hands and feet are always cold. Appetite and digestion are impaired. There is an interference with the calcium metabolism. There is a progressive gain in weight. There may be constant pain in the muscles and bones. (Levi of Paris says that in many cases of chronic rheumatism thyroid treatment is the best.) When nervous or neurasthenic patients complain of such symptoms

one grain of thyroid twice a day, added to the other treatment, is of value. In ten days the effect should be evident in less dryness of the skin, in relief from the sensation of cold, and in the decided improvement of mental activity.

Mental sluggishness in young girls with symptoms resembling dementia præcox, and considered as cases of weakmindedness, may regain mental activity by thyroid extract. The symptoms are not enough to warrant the diagnosis of myxedema, but the dry, scaly skin, dryness of the hair, and coldness of the body suggest the use of thyroid extract (Starr).

Hyperthyroid States.—We observe in women who are not near the climacteric age, in women who have local disturbances of various natures, and in women who have none of these local disturbances, symptoms of very much the same character as are typical of the climacterium, either natural or artificial. While the flushes are not marked or are absent, yet these women have palpitation, irritability of temper, mental depression, psychic unrest, dizziness, sleeplessness, and intestinal disturbances. It is these points which have given rise to the diagnosis of reflex neurosis, neurasthenia, hysteria, etc. It is fair to suppose that in many of these cases we are dealing with aberrant forms of Basedow's disease, or with ovaries which are either not producing a positive secretion that is needed, or which are not producing a proper secretion to nullify such other substances as are able to produce the symptoms that occur in the climacterium, natural or artificial. In many cases a comparison of the symptoms with those of the climacterium, and with the symptoms of aberrant forms of Basedow's disease, had led me to believe that they, as well as the typical annoyances of the climacterium, are due to hyperthyroidism. It is very often hard to distinguish between many forms of "nervousness," on the one hand, and slight or aberrant forms of Basedow's or Graves' disease, on the other.

In only a few of these cases is there persistent tachycardia, but in all, at various times, one or other of the cardinal symptoms have become markedly noticeable. In all of them the mental irritability, the tendency to magnify slight details, the mental unrest, the sleeplessness, palpitation, attacks of weakness, etc.,

are like the symptoms of the climacterium. From our knowledge of this condition we must consider the etiology to be a relative degree of hyperthyroidism.

That the condition of hyperthyroidism may occur in patients without marked pelvic involvement is self-evident. If it may occur in such cases, there is more warrant for accepting a like condition when ovarian function is disturbed by pelvic disease of a circulatory or inflammatory or atrophic nature, such as cases of Freund's disease.

It would be strange if gynecologists had attributed, entirely without reason, to pelvic disturbances so many constitutional and nervous symptoms in women. They have attributed them perhaps too much to these pelvic disturbances acting through reflex channels. There is certainly a large proportion of women suffering from so-called reflex symptoms who cannot be classed under hysteria or under neurasthenia, but in whom ovarian insufficiency or relative hyperthyroidism is probably present. It is often a difficult question from the standpoint of diagnosis, but the predisposition of the female to various combinations of nervous symptoms certainly points to a general state as the causative factor.

The relation of the ovaries to normal functions of a special character in women is decidedly clear; their relation to pathologic nervous states is highly probable. The weaker sex, with its tendency to these affections and to hysteria, will probably in the future be less frequently treated as possessors of nerves alone. It is not probable that ovarin replaces all that the ovaries should furnish, nor can ovarin in a short time overcome injuries long existing. That its action in the above-mentioned affections, supporting the theory of ovarian and thyroid interrelation, may lead to a more rational treatment of certain nervous conditions in the female, both medically and surgically, is not to be doubted.

Realizing the relation of the ovaries to many of these nervous conditions, we may say, in the words of Virchow, "All peculiarities of the female body and mind, or nutrition and nerve function, are only a dependent of the ovary."

Hypophysis Disease.—(1) Hyperactivity of the anterior lobe gives rise to skeletal overgrowth—possibly to hypertrichosis and certain cutaneous manifestations—in brief, acromegaly. (2) Hypoactivity of the anterior lobe is evidenced by preadolescent failure of development in the osseous system and secondary sexual characteristic, etc. (3) Hyperactivity of the posterior lobe causes lowered nutrition and a decrease in carbohydrate tolerance, moist skin, etc. (4) Hypoactivity of the posterior lobe leads to adiposity—higher carbohydrate tolerance, subnormal temperature, somnolence, dry skin, polyuria, polydipsia —in short, the opposite symptoms to the above.

With hyperpituitarism temperamental changes are often apparent with wakefulness, lack of concentration, indecisiveness, irritability, distrust; in other words, psychasthenic states which are not unlike those with which we are familiar in moderate ways of dysthyroidism. When hyperpituitarism dates from early life, the individual is usually deficient in educational training from the outset.

With hypopituitarism there are gradations of disturbance, from mild psychoses to extreme mental derangement. There is inability to concentrate, there is impairment of memory. Former powers of mental activity may be restored, with the readjustment of a physiologic balance, through glandular administration. In most cases of hypopituitarism sufficient to cause adiposity, deviations from the normal intellectual level may be expected. There may also be drowsiness. Psychic disturbances of varying degree are common.

Starr finds that neurotic symptoms may be dependent upon disturbances of the hypophysis. Marked changes in the hypophysis cause (1) gigantism, or acromegaly, on the one side, and (2) a craving for sweets, a disturbance in carbohydrate metabolism, subnormal temperature, slow pulse, dry skin, loss of hair, suggestive of myxedema, and sexual infantilism is a marked symptom of this state. There is a complete lack of sexual desire, and impotence. There are mental changes, such as lack of ambition, indifference to matters of importance, inability to do ordinary work, and a state of mind such as is

seen with chronic opium habit. The extreme forms are easily recognized. In so-called neurasthenics many minor conditions are probably due to disturbances of this gland. There is a type of neurasthenic who is fat, gaining in weight, has a lack of ambition, craving for sweets, and in all probability some of the nervous manifestations are due to the hypophysis. In two or three such cases of marked headache the use of pituitary extract has caused relief and has improved many of the nervous symptoms. These cases may also be improved by thyroid extract, which acts very much like hypophysis. Starr gives one or two grains a day for ten days, then an intermission of five days, and then again.

THE HYGIENE OF PUBERTY

The time when menstruation begins and stops, whether early or late, is often an inherited quality in many cases. It is wise to develop the resistance of the body, which is diminished by the onset of menstruation, so that the girl may meet with greater ease the demands which this awakening sexual function makes. The girl should be nourished and fortified.

Nourishment.—The food should contain albumen and should be easy of digestion. There should be four to five meals each day. The food should consist of much meat, fresh vegetables, vegetables containing iron, such as spinach, beans, and peas. There must be freshly cooked fruit in large amounts. The evening meal should not be too rich or too succulent, and had best consist of eggs, omelet, milk, stewed fruits, etc.

Exercise.—There should be plenty of exercise in the open air; not much if the girl is chlorotic. Simple gymnastics develop the muscles, aid in erect carriage, and develop respiration, circulation, and digestion. Room gymnastics are of very great value, and such work may be done in the gymnasium, or the use of mechanotherapy may be advised.

Clothing.—Clothing ought to be of a kind which does not obstruct the circulation. Corsets for the young are injurious. Clothing must give freedom to breathing, to the thorax and abdomen. There should be no tight bands about the neck, or tight garters, and underwear should not irritate the genitalia.

Sleep.—Eight to nine hours of sleep are sufficient and the rule to be followed should be "early to bed and early to rise."

Routine.—A regular routine of life and regulation of work and responsibility is advisable. There should be active walking in the open air. Not too much time is to be spent indoors or at the piano or sewing-machine. The use of the bicycle is not advisable, but lawn tennis, skating, swimming, etc., are permitted. Literature should be of a wholesome nature and the child must be watched to prevent the habit of masturbation.

Hydrotherapy.—At morning and night we advise a two-minute cold sponge, 50° to 70° F., or a cold shower-bath lasting half a minute. If the girl is anemic or becomes chilled, administer a glass of hot milk or tea some time before the use of the water. Cold water ought not to be used for chlorotics. Scrofular or rachitic constitutions demand the use of salt baths. These girls are poorly developed and menstruate little or late. Sea baths are of value. It is wise to begin at home with salt baths and to lower the temperature gradually so that the girl may become accustomed to sea-bathing in the open air.

Climate.—The effect of climate in disturbances of menstruation and in nervous conditions, as well as in chlorosis, is very important. These states demand an elevation in the mountains of 3000 feet. This acts well on blood-formation and on menstruation, improves the appetite and digestion. If the pulse is irregular and frequent, if there is increased pressure in the arterial system, and if there is little resistance to fatigue, it is better to advise a medium elevation in a wooded country. In winter a mild climate is necessary for anemic and chlorotic girls.

The skin demands special care, for girls at puberty are often liable to acne, comedones, and seborrhea.

In abnormal conditions of the pelvic organs a gynecologic examination should be made only when absolutely necessary, and then under gas anesthesia for it often has a bad effect on the psychic state. The girls imagine they are extremely sick. Gynecologic examination or treatment may cause erotic attacks and may end in a neurosis.

Education.—The social relations of children at puberty should be closely watched; girls are to be taught mild responsibility, and

any tendency toward too early sex curiosity in the field of the organs should be discouraged. In due time the young girl ought to be informed of her normal sex processes. She must be informed of the importance and the significance of biological facts. The literature, play, and amusements of growing girls should be observed, and social relations with the opposite sex ought to be controlled. They are not to be overburdened with mental work; there should be a careful combination of work and relaxation. Education is to be limited to the mental ability of each case. The mental qualities of associates should be noted. The girl at puberty must be kept from excessive religious enthusiasms. Literature of such a nature as does not spoil wholesome illusions is to be selected. Music, painting, etc., are to be considered simply as wholesome relaxations. Attention must be paid to the diet and physical exercise. The food should be of a mixed animal and vegetable nature, with little coffee or tea, with no alcohol. Attention to the proper daily evacuation of the bowels is essential.

Corsets, if worn, should not constrict the body and should not contain bones, and must act merely as a support for the skirt.

Care during Menstruation.—During menstruation the external genitalia should be washed twice daily with water at 85° F., Long walks, horseback rides, too much dancing, etc., should not be indulged in. On the other hand, the period of menstruation should not be viewed as a period of invalidism. It should mean a slight let down in physical activities. The bladder must be emptied regularly. Diet is to be wholesome and nutritious and free from watery foods, especially free of tea, coffee, wine, and beer. In chlorotics the diet must be extremely full for several days.

TREATMENT OF CHLOROSIS

In chlorosis feeding should be carried out every two or three hours. There should be plenty of albuminous food. Breakfast is to consist of, eggs,, zwieback, butter, very weak tea or coffee. Milk to the amount of one-fourth to one-half of a quart at each meal is to be given; more only if solid food is not well borne. There should be a rest of a half-hour before and

after each meal. If girls are anemic and thin, there should be an increase of fats, such as cod liver oil, spinach, milk, butter, and cream, and much carbohydrates, rice, potato purée, sago, tapioca, sweet fruits, asparagus, chocolate, milk, and cocoa. Meals are to be given, say, at 7.30 and 10 A. M., at 4, 7.30, and 9 P. M. If girls are anemic and fat, which condition is often due to lack of exercise and to free feeding, albuminous food should be given and only small amounts of carbohydrates and fat. A dirt rich in vitamins is essential, milk, eggs, tomatoes, oranges, asparagus, spinach, etc.

During menstruation the diet should be increased and contain cod liver oil and fat and some carbohydrates. At 7.30 A. M. one-half quart of milk is to be taken slowly in bed. At 9 tea or coffee with milk, roast beef or steak, or chicken are given. At 11 one-fourth quart of milk, bread and butter, and two eggs. Lunch consists of meat, vegetables, potatoes, plain dessert, fruit. At 4 P. M. coffee with milk, and bread and butter are taken. The feeding at 7 P. M. should be of the same amount as at lunch, or rather less in amount. Soups are to be avoided. If these patients do not care for meat, it may be substituted by milk, with eggs, bouillon, eggs fruit, cocoa, rice, etc.

In chlorosis exercise ought to be restricted. In fact, in severe chlorosis rest in bed of from four to seven weeks is advisable. Tepid sponge-baths should be given morning and night. Sweat-baths are said to increase the number of red blood-cells, the hemoglobin, and the body-weight. Hot baths three times a week at a temperature of 105° F., and of a duration of fifteen minutes to a half hour, are of value, especially if followed by a cold shower lasting only a few seconds, or by a cold rub. This must be followed by a complete rest of one hour. These hot baths are to be continued for a period of from four to six weeks. They have a tendency to improve all the annoying symptoms. Nauheim baths are especially valuable for chlorosis or anemia. They are of importance because they can be given at a lower temperature than other baths. They act on the nervous centers and influence metabolic processes. They ought to be given at a temperature of from 90° to 95° F. and of a duration of ten to twenty minutes (Kisch).

Of great importance is the care of the intestines, and their action must be regulated. It is advisable, once a week, to administer at night a blue-mass pill, 3 to 5 grains, to be followed the next morning by a saline cathartic. Iron is the specific in the treatment and is used in the form of Blaud's pills, or any of the other numerous iron preparations. *Hypodermic injections of iron citrate, in doses of three quarters of a grain, every other day, are extremely useful.* Ovarin is of value as an aid to iron and ought to be administered in all cases. A combination which I use consists of a capsule taken three times a day after meals containing ferri carbonas, 3 to 5 grains; arsen-hemol, 1½ grains; ovarin, 5 grains; phenolphthalein, ½ grain. Arsenic in the form of Fowler's solution may be given with ferro-mannin.

℞. Massa Blaud's (Fischer's) ..... gr. v
Orchic extract ..... gr. i
Acid. arsenos ..... gr. 1/30
Phenolphthalein ..... gr. ¼
M. Ft. tal. caps. no. xxx.
S.—One p. c.

℞. Liq. potassi arsenitis ..... ℥iss
Ferro-mannin ..... ℥vi
S.—℥ij t. i. d. p. c.

℞. Ovarin ..... gr. v
Adrenal nucleoprotein ..... gr. i
Arsen-hemol ..... gr. iss
Ferri carbonatis ..... gr. iij
Phenolphthalein ..... gr. ss
M. Ft. tal. caps. no. xxx.
S.—One t. i. d. p. c.

TREATMENT OF NERVOUS CONDITIONS

Conditions associated with *diminished excretion and abnormal retention in the blood of urea* demand care in the choice of diet. Red meats are to be excluded and only selected vegetables and fruits are to be permitted. I have obtained good results by following the practice of William H. Thomson, who administers blue mass, 5 grains, once a week at night, and who advises the administration of sodium phosphate every morning in hot water and 10 grains of sodium benzoate after each meal.

In addition to that, he gives tincture of aconite for a period of two weeks, followed by the use of nitroglycerin.

In the treatment of *onanie* the greatest difficulty is experienced. Not infrequently, when examination is possible, the existence of this habit is indicated by hypertrophy or elongation of one or both labia, a condition to which Dickinson has called attention. This alteration is produced by either manual touch of the parts or by rubbings in the seated position with the legs crossed. There is often seen a granular moist condition of the small labia, the vestibule is covered by a clear, moist, mucous secretion, and from the vagina comes a hypersecretion of cervical mucus. The condition is by no means infrequent in married women. There is great difficulty in questioning patients, and suggestions as to its avoidance are not calmly accepted. However, patients should be made aware of this condition and its dangers should be pointed out. An active physical life should be advised, muscular exercise insisted upon, and outdoor sports, especially tennis and swimming, are to be recommended. Horseback-riding and the use of the bicycle should be avoided.

In married women a condition allied to this is furnished by *coitus interruptus*, a procedure which produces pelvic congestion and nervous excitement, sometimes of marked nature. In addition, this practice causes congestion and hyperemia which not infrequently result in profuse menorrhagia or metrorrhagia. On the correction of this abnormal sexual practice and the regulation of the process the symptoms, not alone general but local, often improve. We cannot attribute, however, nervous states in women to this factor alone. We must take into consideration a neurasthenic or hysterical basis, and the desires and repulsions in sexual relation. A nervous predisposition is aggravated by coitus interruptus and by onanie.

Retroflexions and retroversions *per se* cause little annoyance save, perhaps, backache. When they are accompanied by pain, some associated condition in the periuterine structures is the responsible factor. Acquired retroflexions are usually the result of labor, and when they "produce" nervous or other symptoms, the retroflexion is usually found to be part of a

general ptosis. With this splanchnoptosis there is a general physical and nervous asthenia, responsible for undue reaction to all stimuli, both subjective and objective. Patients with a psychopathic predisposition suffer most from this general asthenia of subinvolution.

The treatment of *general subinvolution* is discussed under that special section. In some cases it demands an operation. In addition, it requires the use of general tonics, especially strychnin and the hypophosphites, attention to the bowels, the wearing of an abdominal belt, abdominal massage, the sinusoidal current, and a course of carbonated saline baths. The use of ovarin is always advisable. In some instances associated with marked physical and mental asthenia a modified Weir-Mitchell rest cure is of value.

Local treatment for tangible lesions should be instituted unless contraindicated by excessive nervousness of the patient.

Dysmenorrhea, fluor, pain, pruritus, onanie, deserve careful attention. The treatment of these conditions by no means always causes a disappearance of existing neuroses or of vasomotor or psychic disturbances. The correction of pathologic changes, especially such as have seemed to cause the general nervous state, are advisable and valuable procedures, but must be reinforced with general treatment of the nervous condition.

Backache, pelvic pain, leukorrhea, etc., are symptoms of which the patient is conscious. In nervous women autosuggestion may cause a marked reaction to such annoyances; patients magnify the significance of the condition and many become so introspective in their study and thought of their pelvic disturbance as to feel absolutely certain that only operative cure of the local annoyances will restore their nervous systems to the normal.

On the other hand, if patients of a nervous type are made aware of the existence of a movable kidney, of an enteroptosis, of a retroflexion, of a lacerated cervix or erosion of the cervix, and if the physician attributes to these alterations the causation of the nervous symptoms, he often aggravates the patient's nervous state by fixing her attention on a local condition which

has nothing to do with her nervous symptoms or which is frequently only part of a general state.

Pain must be relieved, for it depresses the tone of the nervous system, and has a deleterious effect on appetite and sleep. Long-continued pain wears down the nerve resistance of the patient. Backache and headache may be due to constipation, to diminished excretion of urea, or to conditions which may be relieved by the administration of salicylates, vini colchici, iodid of strontium, ergot, or the glycerophosphates. For temporary relief or for the relief of hemicrania or pain in any part of the body increased during menstruation, the coal-tar products, as prescribed for dysmenorrhea (p. 317) are the best. Pelvic pain and backache often yield to local treatment of pelvic inflammations, congestions, and ptoses. If a cause is not evident on bimanual examination, the pain is often attributed to neurasthenia or hysteria. This is a great error and does innumerable patients injustice. It does take slighter alterations to produce annoyance in patients who have a predisposition to nervousness or to mental asthenia or whose life has been such as to produce a lack of nerve tone, but almost invariably there is a responsible concrete factor which is productive of pelvic pain and backache. If pelvic pain fails to yield to treatment, operation is often necessary for the removal of the cause before the nervous condition can be relieved. This refers especially to ovarian pain, where *removal* of the ovary, tube and varicosities is often the only cure.

Ovarian neuralgia is benefited by warm baths, warm applications to the abdomen, blisters applied to Morris' points, and warm vaginal douches. If the ovarian neuralgia is a symptom of neurasthenia or hysteria (?), the primary condition must be treated. If the pain is severe, hypodermic injections of antipyrin may be used if the internal administration of the coal-tar products brings no relief. Luminal, in ½–1 grain doses, every four hours is extremely useful in these cases. The hypodermic use of morphin should be avoided if possible. Electricity is sometimes of value (p. 151).

In *nervous and neurasthenic conditions* alcohol, tea, and coffee should be avoided. Much time should be spent in the

open air and regular exercise should be advised. In severe cases absolute rest is essential. Reading and mental exertion should be avoided. The diet must be light and easy of digestion and the bowels should be carefully regulated. In acute cases a nurse should be in charge of the patient. Isolation, according to Clarke, is not necessary, unless the patient does not improve. Gentle rubbing of the whole body or the sheet-bath once or twice a day is valuable. A small dose of alcohol may rarely relieve nervousness and promote sleep. For insomnia a sheet-bath is given in the evening. Hot sponging to the spine or a wet pack is of value, to be reinforced, if necessary, by drugs. For the sleeplessness and excitement baths of 85° to 95° F. are soothing. Care must be taken to *prevent insomnia from becoming an established habit*, and drugs such as bromids, chloral, luminal, and allonal may be used, but not for long. In severe cases a Weir-Mitchell treatment is advisable. Of the electric currents, the sinusoidal is particularly efficacious. If the condition of the patient is phlegmatic and psychic irritation is not marked, a course of Nauheim baths is often of value in rousing and stimulating the patients, mentally and physically. Change of air and scene is of great benefit. In individuals of an irritable nature climate of even temperature is good, while in the phlegmatic type an elevation with stimulating air is better. Massage is excellent in many cases. Among drugs arsenic is of value, also valerianate of zinc in pill form, with a small dose of quinin and iron; compound syrup of hypophosphites; the glycerophosphates. A quiet country life exerts a soothing influence, and is one of the most useful means of treatment.

The bromids and luminal are essential in excitable states, for nervous and genital excitement, for nymphomania, onanie, etc. The addition of the glycerophosphates avoids a too depressing influence when long continued (p. 515). Bromids should not be given in exhaustion of a nervous character.

Strychnin, orchic extract and suprarenal cortex are important in the treatment of functional atony and relaxation, in mental or physical exhaustion.

℞. Zinci valerian.
Quin. valerian.
Ferri valerian..... āā gr. j
Ext. cannab. indic..... gr. ¼
Ft. tal. pil. no. xxx.
S.—One p. c.

The glycerophosphates, plus orchic extract and suprarenal cortex, may be given in capsules or they may be given in five-grain tablets. Each tablet contains—

Calc. glycerophosph..... gr. iiss
Sodii glycerophosph..... gr. iiss

Or—

Calc. glycerophosph..... gr. iiss
Sodii glycerophosph..... gr. iiss
Strychn. glycerophosph..... gr. 1/60

Or—

Calc. glycerophosph..... gr. iiss
Sodii glycerophosph..... gr. iiss
Quinin. glycerophosph..... gr. ¼
Strychn. glycerophosph..... gr. 1/200

Or—

Calc. glycerophosph..... gr. ij
Sodii glycerophosph..... gr. ij
Ferri glycerophosph..... gr. ½
Mang. glycerophosph..... gr. ¼
Quinin. glycerophosph..... gr. ¼
Strychn. glycerophosph..... gr. 1/200

℞. Quinine sulphate..... gr. xv
Arsenic trioxid..... gr. i–iss
Extract of cannabis indica..... gr. vij
Mix and divide into thirty pills.

Luminal..... gr. ¼
Orchic extract..... gr. i
Pituitary anterior..... gr. iii
Calcii Glycerinoph..... gr. v.
M.—Ft. tal. capsul. No. xxx
S. one p. c.

Forced feeding is often an essential procedure in many of these cases, especially in those who have lost in weight or who have limited themselves to a restricted diet because of real or imaginary inability to digest certain foods. The best method of feeding these cases is to give them a diet which at the same time overcomes the constipation that is very often an asso-

ciated annoyance and to which many patients attribute all their ills. (See section on Constipation.) Food, particularly milk and eggs, can be taken every hour or two in small portions. Absolute rest in bed is not always necessary; a certain amount of exercise is beneficial and promotes appetite. Milk, cream, cocoa, chocolate, butter, eggs, and nutritious preparations in the form of thick cereal or cream soups are of value. Butter, the yolk of eggs, etc. may be added to the soups. Puddings, toast, zwieback, omelets, cereals with butter and cream, are well digested. Peas, beans, and lentils permit of the addition of butter. Fruit jellies, honey, compots, and fresh fruits have a good effect on constipation. In obstinate constipation the grosser forms of vegetables may be given. Of meats, the best are filet, veal, and fowl, which are to be prepared in pure butter. Fish may be added. Milk, or one of the sour milk preparations, such as kumyss, fermillac, or lacidof, forms an important part of the diet, but should not exceed two quarts a day.

In the severe forms of neurasthenia a rest cure is all-important. This method is of great aid in the after-treatment of operated patients, especially such as have been reduced to a very nervous condition by long-continued pain. The method followed by Dubois with slight modifications is excellent. He demands: (1) several weeks (ten to twelve) spent in bed in quiet, away from home in a sanitorium, (2) isolation, generally without visits or letters. Occasional visits, occasional epistolary relations, may be allowed if the patient is not too emotional, if trifles are not too annoying, if family affairs are pleasant, (3) forced feeding. For the first six days only milk is given, every two hours from 7 A. M. to 9 P. M. in divided amounts. Twenty-four ounces are given the first day, thirty-six the second, forty-eight the next day, fifty-seven the fourth day, sixty ounces the fifth day. On the sixth day sixty ounces are given and at breakfast time, *i.e.*, with the first dose of milk, bread, butter, sweets or honey are added. On the seventh day the diet changes to the following to which cod-liver oil should be added:

Breakfast.—Milk, 12 ounces, bread, butter, honey or preserves.

10 A. M.—Milk, 8 ounces (or zoolak) and orange juice.

Lunch.—Full meal, varied and copious (especially as to butter, eggs and vegetables).

4 P. M.—Milk, 8 ounces (or buttermilk).

Supper.—Full meal, varied and copious, especially as to vegetables, fresh and stewed fruits.

9 P. M.—Milk, 8 ounces and orange juice.

The dislike for milk usually disappears. By the addition of lime-water, sugar of milk, pepsin, etc., its digestibility and action on the bowels can be regulated. Constipation lasting three days is overcome by a high enema. Later on the amount of food taken overcomes this tendency. If it persists, a suppository of glycerin may be given at the same hour each morning after breakfast to accustom the patient to regular evacuations.

The patient should have the time and interest of the physician, for the influence of the physician is an important factor; to Dubois, almost the all-important factor. To him psychotherapy, the therapy of suggestion, plays an essential rôle. I heartily recommend the reading of his work on "The Psychic Treatment of Nervous Disorders," translated by Jelliffe. While perhaps extreme in the scope claimed for it, except in the hands of the experienced and gifted, it shows the marked value of psychotherapy, a therapy which many practice unconsciously or consciously, but a therapy of the very greatest value in the treatment of many of the associated nervous conditions in gynecology.

Professor J. R. Angell has said: "When we talk about therapeutic methods of treating diseases through the mind, it does not mean that we are not producing any change in the nervous system; it simply means that we are producing changes in the nervous system by initiating changes in what we call the mind; and, as a matter of fact, when we come to conclusions and see what we have done, we have said something, done something, or brought something to pass which affects the sense organs of the person with whom we are dealing, and that process inevitably affects the brain. Mental processes have corresponding brain processes, and if we are not able to point them out at any particular time, it is in consequence of our ignorance and not because the facts are lacking to substantiate it."

"From the beginning of time physicians have made more or less use of psychotherapeutic methods, in that they have brought and are bringing to the sick room a hopeful personality, cheerfulness, and an attitude of encouragement to the patient. I have nothing but the deepest respect and the deepest confidence in the outcome of the use of psychotherapeutic methods by medical men. Our attitude toward the ministers or laymen who are working under medical control is essentially this: There is a large group of individuals who, to all intents and purposes, are mentally abnormal, who need help, and who, in the first place, are not likely to go to a physician to get that help, because their troubles are perhaps moral rather than physical. If they should consult a physician, they are not likely to get from the average physician what they really need, and I cannot but believe that ministers who are well trained for their duties have a wide range of usefulness in this particular direction, and I think it is problematic whether the medical practitioner can really fill the bill, and whether he will wish to try to, or whether he ought to try to."

Dr. S. Kuh has said: "The physician's method of dealing with his patient is of paramount importance. The neurotic individual is usually a keen observer. He watches with the greatest interest the examination of the physician, notes whether this or that organ has been overlooked, and whether the investigation is made in a careful and painstaking or in a slovenly manner. Next to the physician's personality, I should value the influence of the first examination most highly. It must indicate to the patient that his physician takes a genuine interest in the case. The best results in psychotherapy are undoubtedly obtained when the patient is transplanted into new surroundings; for most of the serious and tedious cases such a step is absolutely necessary. Even the nurse, as a rule, should not accompany the patient from his home to the sanitarium. Here begins a process of re-education, which in every instance must be adapted to the individual, and for which no hard and fast rules can be laid down. An intelligent nurse, one who supports the physician understandingly in his efforts, who strengthens the patient's confidence, who diverts his mind from

his troubles, and pains, and aches into more pleasant channels, is a *sine qua non* of success. For patients who are anemic, emaciated, poorly nourished, and for those who suffer from anorexia, hypochondriasis, and the various phobias, a rest cure is often the best thing. Others may do better if sent to the country or to the mountains, where they receive new impressions and where an occupation may be found which keeps them busy, without making great demands in the way of intellectual labor. Again, others will progress most rapidly toward recovery in an institution adapted for the so-called work cure, a place where carefully regulated manual labor is prescribed according to the needs of the case. The therapeutic agent under discussion is most useful in such functional neuroses as hysteria, neurasthenia, and psychasthenia. But its usefulness is not limited to such troubles. All of us make use of psychotheraphy constantly, often utterly unconsciously, as a palliative in all manner of organic disease. To instil hope into the breast of the despairing, to arouse the individual who has given up the struggle to fight anew, are things that are well worth doing, even in organic and incurable diseases. That we have not recognized the importance of psychotherapy has driven a host of sufferers into the hands of laymen, who were willing and more or less capable to make use of a method, perfectly legitimate in itself, but on which the medical profession frowned. In place of abusing those who are ready to do what we ourselves should have done long ago, let us make use of the powerful weapon at our command, and the cause for complaint will disappear."

Climacterium.—A symptom of climacterium is the disturbance of vasomotor function characterized by flashes, dizziness, restlessness, etc. These may be treated by baths of 90° to 100° lasting fifteen minutes, which diminish the blood-pressure and are recommended by Gottschalk. For abdominal plethora and obesity, the use of Glauber's salts, general massage, and exercise are important. If the nervous symptoms are marked and are of a sexual character, cool body douches and the bromids, heroin, and hyoscin are helpful. Ovarin (gr. v, t. i. d.) should be given in all cases. The soluble aqueous extract of corpus

luteum relieves the hot flushes promptly, and aids in reducing the blood-pressure in many instances. The contents of one ampoule, 1½ c.c., are injected intramuscularly every day for two or three weeks. In the treatment of those conditions of a nervous nature complicated by profuse bleedings, ergotin, stypticin, and radium are useful. The carbonated saline baths are more or less contraindicated when bleedings are profuse.

In many of the excitable nervous cases the use of bromid luminal and glycerophosphates is followed by good results. I am in the habit of administering 5 grains of sodium glycerophosphate and 10 grains of strontium bromid in one dram of water, or elixir of pepsin, three to four or more times a day.

R. Strontii bromidi..... ℥ii
Luminal..... gr. v
Aq. menth. pip..... ℥iij
S.—℥j every four hours in water.

℞. Strontii bromidi..... ℥ii
Luminal..... gr. v
Sodii glycerophosph..... ℥ij
Elixir pepsini..... ℥iij
M. S.—℥j t. i. d. p. c. and at night in water.

In the treatment of cases of hyperthyroidism, or of aberrant Basedow's disease associated with tachycardia, ovarin, 110 grains, should be administered with whatever form of treatment is used. Local treatment, ovarin, luminal and the use of mild carbonated baths often aid in putting cases of hyperthyroidism in good condition. Rest should be advised. Meat and sea-food should be forbidden. A vegetable diet is advisable. Sodium phosphate, ℥j in hot water a half hour before breakfast, should be ordered. Intestinal fermentation is to be prevented by a pill of blue mass (gr. v) once a week and by sodium benzoate (gr. x) in capsules one hour after each meal, this being the method W. H. Thomson follows in the treatment of Basedow's disease. In all cases in which both ovaries have been removed the routine administration of ovarin, 110 grains three times a day, should be instituted shortly after the operation.

CONSTIPATION

By George Mannheimer M.D.

PHYSIOLOGY

The function of the bowel is fourfold: Secretory, absorbent, motor, and excretory. The small intestine exhibits two sorts of movements, mixing movements and peristalsis proper. The chyme passes through the small intestine (20 feet) in three and one-half to six hours, through the colon (5 feet) in twenty to twenty-four hours The remains are stored in the sigmoid and upper rectum.

The feces are derived from three sources: (*a*) food residue; (*b*) intestinal contributions; (*c*) bacteria. The food residue consists of the indigestible parts of the ingesta and of the digestible portions which for some reason have escaped digestion and assimilation. The intestinal contributions are the digestive juices which have not been re-absorbed, intestinal mucus, and desquamated epithelia. The number of bacteria varies considerably.

Starvation feces are made up largely of bacteria, intestinal mucus, and desquamated epithelia.

The normal quantity of feces passed by a healthy adult living on a mixed diet ranges from 130 to 250 gm. (4 to 8 ounces approximately) of which 35 to 70 gm. are dry residue and 75 per cent. water. It is much larger on a vegetable than on an animal diet.

The large bowel, which is chiefly responsible for the production of constipation, exhibits three forms of movements: Mixing movements, peristaltic waves, and tonic contractions.

1. Mixing movements, a to-and-fro pushing of the contents, are confined to the cecum, the ascending colon, and the first third of the transverse colon. They favor secondary digestion by bacteria, absorption, inspissation, and the shaping of the feces. As long as these movements last, a tonic contraction

results at the boundary of the first and second third of the transverse colon, the neuro-muscular ring of Keith. This isthmus normally permits the passage of small particles in spurts, just like the pylorus.

2. Peristaltic waves are the real propulsive force of the feces, the large bowel contracting behind and opening up in front of the advancing column. The feces gather in the middle third of the transverse colon and are transported in short pushes along the splenic flexure and the descending colon to the sigmoid and even into the ampulla recti. There is, however, considerable physiological variation as to the distribution of the fecal mass within this space, and as to the timing of its transportation. Consequently there cannot be one single normal type of bowel action, and the transition from a normal to a pathological action is very fluent indeed.

3. Tonic contractions running over smaller or larger districts of the bowel make it temporarily impassable for feces. They also present fluent transitions from the normal to the pathological. Whenever they occur at the wrong time or place, or from abnormal stimuli, or if they are too strong, or of prolonged duration, they interfere with fecal passage and are called spasms or cramps.

The expulsion of the feces is a mechanical act, largely independent of the movements just mentioned. Transportation down to the terminal bowel may be deficient and the expulsion normal, or vice versa. The former modus is most commonly responsible for chronic constipation. Of course there may be a combination of the two factors, *i.e.* primary colonic sluggishness may be complicated by sluggish defecation, which latter is frequently brought about by improper treatment, especially by the habitual inappropriate use of enemata. Defecation is subject to physiologic variations. Under a mixed diet, the irritation of the fecal mass induces one or several peristaltic waves of the sigmoid and of the ampulla which are aided by the abdominal press, and at least one daily evacuation results. A purely vegetarian diet leaves so much residue that its mechanical irritation acts two or three times a day. On the other hand, the smaller the residue from the food, the less fre-

quent the evacuations. In addition, there are physiologic variations in excitability or sensitiveness of the terminal bowel.

The anal orifice is closed through the tonus of the sphincter muscles, aided by the levator ani. The fecal column in its descent through the rectum produces a reflex contraction of the sphincters or a short augmentation of their tonus which we interpret as the desire to go to stool (nervi hypogastrici and erigentes; lumbar enlargement of the cord). Then a relaxation of the external sphincter takes place through voluntary cerebral inhibition, rectal peristalsis continues, the abdominal press is set in motion, the levator ani contracts and lifts the anus over the advancing column.

Excitation and Inhibition of Colonic Movements.—The nerve center for the intestinal movements is the plexus myentericus of Auerbach, situated between the longitudinal and circular muscle-layers throughout the entire canal. Under normal conditions, it regulates peristalsis irrespective of external influences, simply through irritation of the intestinal contents. This requires a certain excitability, and this is brought about by a *hormone*, *cholin*, which is generated by the wall of the intestine and the stomach, and by the spleen. Similarly, the hormones of the *thoroid and pituitary* glands may excite peristalsis. The plexus myentericus is under the influence of the vegetative nervous system, the parasympathetic (vagus) acting as a stimulus, the sympathetic as an inhibition to excitability.

Many forms of hyper- and hypoperistalsis are produced by way of the vegetative nervous system. Great fright or joyful excitement stimulate peristalsis in some persons, and paralyze it in others, depending upon the degree of excitability of the vagus and sympathetic at the time, or, in other words, depending on whether the individual happens to be vagotonic or sympaticotonic.

Stimulation or inhibition can reach Auerbach's plexus from various parts of the body, because of the intimate connection of the vegetative nervous system with the cerebro-spinal axis. These reflexes play a rôle in gynecologic conditions and

in renal or ureteral colic, but are of minor importance in that syndrome commonly called chronic constipation.

The excitability of the plexus of Auerbach varies in different individuals as well as in the same individual at different times. Nothnagel defined chronic functional intestinal sluggishness as an abnormal regulation of colonic and rectal peristalsis. This definition might properly be changed into diminished excitability or excitation of Auerbach's plexus.

Certain vagus fibers form a plexus on the serous coat and send fibrillæ from there directly to the muscularis. Stimuli, emanating from the mucosa, serosa, or from the vagus centers, and traveling through this plexus, induce tonic contractions or spasms. Just those branches are frequently overexcitable in neuropathic individuals (mucous colic).

Ordinary chronic functional sluggishness, or, more explicitly termed, diminished excitability (hypotonus) of the neuromuscular peristaltic apparatus of the plexus of Auerbach, is very often complicated by a spastic element. This does not justify us in setting up two distinct syndromes, spastic and atonic constipation. The terms "mixed atonic spastic constipation" (von Noorden) or "dyskinetic constipation" (G. Schwarz) are more appropriate.

The term constipation cannot be accurately defined. Generally speaking, it means an infrequent or insufficient evacuation of the bowels. Most healthy adults have one movement a day, some have two or three, and others one in two or three days. These variations in frequency and quantity become pathologic when they produce subjective or objective disturbances, be they ever so slight, in the intestinal tract, in remote organs, or in the general condition.

In this chapter we wish to discuss only the so-called habitual constipation of adults. We are not concerned with constipation in infants and children, with acute constipation in febrile diseases or after operations and injuries necessitating rest in bed, with those forms of symptomatic constipation which are due to organic diseases of the digestive tract, to pelvic diseases, to cardiac, pulmonary, or renal trouble, to mental or other disturbances of the central nervous system, to systemic diseases,

such as anemia, diabetes, etc., or to intoxications, such as lead poisoning.

Habitual constipation is much more common in women. Their more sedentary life, their liability to pregnancy and the puerperal state with its atonic, asthenic sequelæ, their tendency to peculiar local pelvic troubles which may interfere with or inhibit intestinal peristalsis, all lead to a constipation which is merely symptomatic in the beginning, but which is readily perpetuated into a habit, even after the original pelvic troubles are corrected.

ETIOLOGY

There may be a congenital weakness of intestinal peristalsis which manifests itself from birth and persists throughout life. It may run in families. But the commonest causes are acquired:

1. Bad habits and unhygienic living. (*a*) Neglect to attend to the calls of nature. The normal desire for defecation is suppressed through laziness, mental preoccupation, ignorance, prudishness, or lack of time and proper facilities. With the poor, lack of decent and comfortable accommodations is a factor of no small importance. (*b*) Reading while at stool, thus diverting the attention from an act which requires full concentration. (*c*) All irregular habits of life, as irregular meals, sleeping hours, frequent trips. (*d*) Sedentary occupations and lack of exercise; factors, however, which are somewhat overestimated.

2. Improper food. This usually refers to food which leaves too little residue and consequently produces in the colon a too slight peristaltic and secretory stimulus. Such is the food of many persons of the wealthy class, who consume highly nutritious and easily assimilated food-stuffs, principally nitrogenous. Others, especially dyspeptics, restrict their diet to what they consider easily digestible. The physician may be responsible for the evolution of constipation by prescribing a too one-sided diet. This cannot be avoided with diabetics, where we have to choose the lesser evil. Generally speaking, all exclusive dietary schemes, such as a milk diet, etc., act in the manner mentioned above. Even a strictly vegetable diet, which in the beginning

powerfully excites peristalsis and secretion, producing copious passages, may also in the course of time overtax those functions and finally lead to atony. Some women exclude from their diet all fats and oils either because of dislike or because of the fear of obesity or of an injurious effect on the complexion. Poor teeth may prevent people eating what they ought, or produce dyspepsia and constipation through improper mastication. Many individuals abstain from water because they do not care for it or because they prefer to take it in the form of stimulating drinks, or because they fear that it conduces to obesity. This latter belief is absolutely unfounded. No amount of water taken during or between meals in itself will lead to obesity, unless the person develops a better appetite on drinking at meals. On the contrary, it is one of the tricks of some obesity cures to let patients drink as much water as possible before meals to fill the stomach and so reduce its capacity for solid food. Too little water is deleterious to normal intestinal peristalsis and secretion, as is shown by the fact that patients with pyloric stenosis are almost always constipated, because water is not absorbed from the stomach but only from the intestines. Diabetics are often constipated because they excrete so much water through the kidneys. People who undertake severe physical or prolonged work which provokes profuse perspiration are apt to become constipated. It is not to be assumed that the water ingested simply dilutes the feces. We all know from experience that it may excite peristalsis when taken very cold (cramps), but its main action after its absorption into the blood, the plasma of which contains 90 per cent. of water, consists in furnishing the principal material for most secretions, including the digestive juices. It must be mentioned that constipating substances are often ingested with food and drink, wittingly or unwittingly; for instance, large quantities of lime in some drinking-waters, alum in adulterated flours and baking-powders, salts of lead in cheap candies, salts of copper in pickles and condiments, and, last but not least, iron given or taken for medicinal purposes during a too prolonged period.

3. The abuse of aperients, a widespread evil. Physicians, druggists, and laymen are responsible for it, and women

especially have acquired the habit of self-dosing. Alluring advertisements of anti-constipation remedies, scattered broadcast all over the land, do their share in perpetuating the curse of self-dosing. In general, purgatives and laxatives are used too readily and indiscriminately for all sorts of conditions and complaints.

Their use is persevered in too long or repeated too often in spite of the obvious fact that after a thorough cleansing there is nothing left for the bowels to work upon, and that a period of apparent constipation is necessary for the reëstablishment of natural action.

Hospital and dispensary physicians are great offenders in this respect. In many hospitals it is the routine to administer a purge to almost all patients on admission and to continue some form of laxative or enema throughout the whole stay, even with patients who had no intestinal difficulty before. This entire matter is left to the discretion of the house-staff, men fresh from college, who are not familiar with the strict indications for the administration of aperients (although they know the difference between castor oil and croton oil, between a hydragog and a cholagog), and who do not realize that the patient's intestinal functions may be permanently damaged thereby.

In dispensaries this practice is as bad or worse, not only in the medical divisions, where most cases of symptomatic and idiopathic constipation are treated, but also in the neurologic, gynecologic, and dermatologic departments. So many nerve and skin affections are ascribed to autointoxication resulting from constipation, so many pelvic affections in women are ascribed to or supposed to be aggravated by constipation, that it is small wonder that physicians prescribe aperients galore. We believe that the autointoxication theory is carried entirely too far. In the medical division constipation cases excite no particular interest. They are usually dismissed with a prescription calling for salts or cascara, etc., and perhaps with offhand dietetic directions. Rarely does the physician go into the etiology. Rarely are full and proper dietetic directions given. Seldom are physico-therapeutic measures prescribed or administered. The physician excuses himself on the ground that he

has nothing else at his command, and that dispensary patients are not satisfied unless they get a prescription.

While speaking of drug-abuse, I wish to mention that the use of narcotics is often a self-evident cause of constipation.

4. Weakness or injury of the abdominal and perineal muscles, for which pregnancy and parturition are common causes. I wish to emphasize the fact that the so-called abdominal press (abdominal muscles and diaphragm) has nothing to do with peristalsis proper, and that this aid comes into play only with the act of expulsion of the feces from the lower rectum, as is likewise the case with the levator ani.

5. Mental and nervous influences. Just as a sudden fright is known to produce diarrhea, so worry, grief, and other depressing emotions may inhibit peristalsis. Prolonged mental effort acts similarly. Hysteria and neurasthenia, so-called, are frequently accompanied by constipation. The disturbed nervous equilibrium which affects almost all the body functions also upsets normal peristalsis and secretion.

6. All factors which debilitate the entire system. In chronic diseases with progressive emaciation and debility the intestinal functions may naturally become weakened.

Frequently several of the aforementioned causes are at work simultaneously.

Habitual constipation is common in old and in obese people. With advancing years the muscular and glandular structures and functions deteriorate; food is selected more carefully and active exercise is not indulged in.

In obesity great masses of fat in the parietes, in the omentum and mesentery may act as a mechanical impediment to peristalsis and the intra-abdominal circulation. To these is added the well-known repugnance of stout people to active exercise.

PATHOLOGY AND PATHOGENESIS

Adhering strictly to our original definition, there can be no pathology of habitual constipation. No one succumbs to this malady except those rare cases of idiopathic dilatation of the colon where obstinate constipation begins at birth, persists into adult life, with ballooning of the abdomen, and where enormous dilatation of the colon and sigmoid is found to be associated

with hypertrophy of the muscularis and secondary ulceration of the mucosa (Hirschsprung's disease). There have been many autopsies on cases with antecedent history of habitual constipation, but who have died from other diseases or from injuries. In a very few of them degenerative changes were discovered in the splanchnics, the motor nerves of the longitudinal fibers. In a few others the only anomaly found was a muscularis of the colon below the average thickness (0.12 to 0.25 mm. as against 0.5 to 1 mm.). This condition, which is doubtless responsible for defective peristalsis, is probably a congenital hypoplasia and cannot be recognized during life. It must be emphasized that these are not cases of general emaciation of cachexia where *a priori* muscular defects might be expected.

However, three anatomic lesions have often been and are still mentioned as the underlying causes of habitual constipation: (1) Atrophy of the muscularis; (2) peritoneal adhesions; (3) displacements of the colon.

Atrophy of the muscularis occurs with or without atrophy of the mucosa, and is the outcome of intestinal catarrh, but not the invariable result. Hence it plays no rôle as a causative factor of primary habitual constipation. It can rarely be recognized during life.

Peritoneal adhesions are found generally in the ileo-cecal region and at the hepatic, splenic, and sigmoid flexures. These are not the cause but the effect of chronic coprostasis, through the medium of stercoral ulcers or of diverticula. Adhesions remaining after attacks of appendicitis, after gastric or duodenal ulcers, after laparotomies, may, but rarely do, cause constipation.

Displacement of the colon, especially of the transverse part, is often a sequence of its habitual overloading with stagnant fecal masses. The colon is simply dragged down by mechanical weight.

Congenitally abnormal length of the sigmoid is a common cause of constipation, when this condition is not outgrown. Congenitally abnormal length or shortness of the mesentery may be responsible for displacement of the intestines, but usually these displacements are a part of a general splanchnoptosis.

The habitus enteroptoticus which is congenital differs from the normal state in the following characteristics: Long, narrow, flat thorax; acute costal angle; floating tenth ribs; the epigastric and both hypochondriac regions are longer than wide; the viscera find better accommodation in the vertical than in the horizontal direction. If such persons lose flesh, especially parietal and omental fat, or if their abdominal walls become flabby and the recti gape, as after confinement, or if they lace tightly, the stomach, colon, and kidneys sink down and constipation often follows. Individuals endowed with the enteroptotic habitus are specially prone to functional gastro-intestinal disturbances; or, in other words, their digestive functions are upset by influences which do not affect a normal constitution. This habitus has therefore also been called asthenia universalis congenita (Stiller). This asthenia concerns preëminently the gastro-intestinal musculature (atony), but also the nervous system, and manifests itself in a variety of neurasthenic or hysterical symptoms. Thus the common combination of enteroptosis, atony (dyspepsia and constipation), and nervousness will be understood.

SYMPTOMATOLOGY

Habitual constipation is compatible with the enjoyment of full health. How long this can continue is difficult to determine. Such individuals either have a very good nervous system or they disregard slight symptoms or become habituated to them.

Usually there are symptoms, either local or remote or general. The first are abdominal discomfort, fullness, tension, bloating, borborygmi, flatulence, bad taste, fetor; smooth, round or cylindrical masses palpable in the sigmoid; dry, dark, hard scybala. Slight pain is not unusual. Attacks of colic deserve special consideration. They sometimes dominate the clinical picture to such a degree that these cases have been specially designated spastic constipation. They may cause fecal retention with secondary inflammation or ulceration of the mucous membrane, proximal to the stagnation. This condition manifests itself as constipation alternating with diarrhea, with

mucous, blood, and pus in the stools. Such cases must not be treated as diarrhea or chronic colitis. The stools are of small caliber, of pencil or small finger shape, or small round balls like sheep-dung. These individuals are markedly neuropathic, and are usually women suffering from pelvic troubles. During a large part of their lives they have accustomed their bowels to cathartics. They may have acquired a simple or membranous enteritis.

Paul Cohnheim claims that almost every case of habitual constipation goes through the following stages: (*a*) atonic; (*b*) catarrhal; (*c*) spastic stage; (*d*) enteritis membranacea; (*e*) colica mucosa; (*f*) mucous diarrhea. This classification is somewhat schematic, but instructive and practical.

With considerable coprostasis there may be very severe attacks of colicky pain with tympanites, fainting, even collapse and vomiting, reminding one of ileus. Backache is common.

Of the remote organs the stomach is first affected by habitual constipation. There may be eructations, bloating, fullness, nausea, anorexia, pain up to severe gastralgia. Gastric ulcer may be simulated.

The heart may also show symptoms, such as palpitation, disturbed rhythm, precordial oppression, up to pseudo-anginal attacks.

The upward pressure of the diaphragm by accumulation of gases and feces may cause shortness of breath.

Nervous symptoms are common, viz., pressure, heaviness or a feeling of heat in the head, lassitude, and dizziness; often headache, inability to do mental work, depression of spirits up to a well-developed picture of hypochondriasis. Insomnia is frequent. Facial neuralgia and hemicrania may also occur.

Rectal accumulations may alter the position of the uterus and by direct pressure may give rise to sciatic, lumbo-abdominal, or pseudo-ovarian neuralgia. They may likewise produce dysuria.

Albuminuria and cylindruria are by no means rare in chronic constipation.

Anemia and chlorosis are by some supposed to be the consequence of chronic constipation (copremia—Andrew Clark). The strict proof of this causal connection is lacking.

Stercoral fever is more often seen in infants and children than in adults. If women in the puerperal state or after gynecologic operations develop fever which is relieved by purgation, coprostasis *per se* is not the responsible factor. Pressure is possibly exerted on small pelvic inflammatory foci, which are thus more readily absorbed, with the consequent preduction of fever (Küstner).

The pathogenesis of these various symptoms is to be explained in different ways. (*a*) Reflexes mechanically produced; (*b*) symptoms of a neuropathic disposition provoked by the intestinal trouble; (*c*) intestinal auto-intoxication.

These three hypotheses do not exclude each other. The first two are easily understood. A few words as to the last. From an extensive study of the literature the following conclusions can be derived. It cannot be proved by our present methods that simple constipation increases decomposition in the intestines. There is much less absorption from inspissated stagnating masses, such as form the contents of the colon in ordinary hypoperistalsis, than from stagnating fluid masses such as we find in defective peristalsis of the ileum and jejunum.

Increase or decrease of intestinal decomposition need not be the consequence of motor disturbances, but may be the cause thereof. The normal products of fermentation and putrefaction, especially gases and volatile fatty acids, stimulate peristalsis of the large bowel. If because of improper food the residue be small, the number of intestinal bacteria is apt to decrease as well as the amount of decomposition products. Lastly, the quantity of aromatic bodies in the urine (indicanuria) is no accurate indicator of the amount of bacterial activity in the intestine, nor of decomposition and absorption of bacterial products.

Habitual constipation rarely exists for any length of time without the development of one or more of the following sequelæ: Hemorrhoids, anal fissure, catarrhal inflammation of the whole or part of the colon or rectum, ulceration (stercoral ulcers), dilatation, coproliths, displacements, diverticula, and hernia (from habitual straining). The more serious sequelæ are appendicitis (from fecal concretions), peritonitis (from ulcers or diverticula), and intestinal obstruction.

DIAGNOSIS

A diagnosis of constipation is generally easy. Patients usually tell us they are constipated and have to use artificial help to procure passages either regularly or frequently (complete constipation), or only at intervals (incomplete constipation). But then it is incumbent on us to determine whether we are dealing with a primary idiopathic habitual constipation or with a symptomatic one; *i. e.*, we must exclude all conditions, local, remote, or general, which may give rise to constipation. This requires a thorough examination of the entire body. We should never omit a rectal and vaginal examination. How else can we recognize rectal cancer, so commonly accompanied by coprostasis; or those much disputed rectal folds (Houston's valves) which, when hypertrophied, offer a mechanical impediment to the descent of the feces; or fecal accumulations in a wide ampulla which are, for instance, always found in fragmentary constipation even immediately after an evacuation; or the empty contracted rectum in spastic constipation; or uterine displacements and pelvic exudates? A careful palpation of the abdomen will give the most valuable information. Aside from neoplasms, and other structural lesions which may have to be excluded, it will reveal that most characteristic objective sign of chronic constipation, fecal tumors. They are of doughy consistence, of bead-like arrangement, moldable by pressure, movable, and affected by purgatives or enemata. But sometimes these characteristic symptoms are absent, and then the differential diagnosis between fecal and other abdominal tumors becomes extremely difficult. We cannot enter into differential diagnostic details. We only wish to mention here one diagnostic method which is neglected too much—probatory lavage of the colon. This is done as follows: The bowels are emptied by a purgative or by enema. Then through a rectal tube connected by cannula with a rubber tube and glass funnel ½ to 1 liter of warm water is allowed to run in and out of the colon by alternately raising and lowering the funnel; fresh water is always introduced until the return is clear. The washings are allowed to settle and examined macroscopically and microscopically. We look especially for mucus in large

or small shreds, pus, blood, and tissue particles. Their diagnostic value is evident.

Colitis, one of the most common causes and sequelæ of chronic constipation, can only thus be recognized. In this condition the colon proves to be tender on palpation, but so it is also in simple spastic constipation, where we often feel the sigmoid, descending or ascending colon as tender, firmly contracted cords which change form under our fingers.

Only in rare instances is the fecal passage uniformly retarded throughout the entire length of the colon. More commonly, it is a circumscribed part of the colon, the movements of which are disturbed. This can best be recognized by the x-ray picture.

For purposes of convenience we can distinguish four types:

1. The ascendens type. The proximal colon remains filled for several days, the distal colon is empty. Occasionally, pieces break off and are evacuated. Here the mixing movements in the proximal colon or the muscle-play at the ring of Keith are at fault.

2. The transversum type. The transversum is filled throughout its entire length, whereas normally we see gaps in the opaque filling—caused by the long waves. It is especially common in cases of coloptosis.

3. The descendens and sigmoid type. The opaque band of the descendens is narrow and shows marked haustrations, a picture commonly seen in spastic constipation.

4. The rectum type. A thick ball accumulates in the rectum and remains for days. From time to time evacuations take place but they are incomplete and do not empty the rectum. This condition is called fragmentary constipation by Boas, proctogenic constipation by Strauss, and dyschezia by Hertz.

These types are schematic. There are transitions and combinations.

Spastic phenomena manifest themselves as attacks of colic in which the usual cathartics do not act at all or only in enormous doses and with great pain. The sigmoid feels like a contracted cord, the anal sphincter like a tight ring. The rectum is empty. On the x-ray picture of the colon enema the shadow

of the descending colon appears smaller than usual and is interrupted at the recto-sigmoid angle; the haustrations are very marked.

Temporary or prolonged diarrhea or the patient's assurance of one daily movement should not mislead us. Irritation of the mucosa by hard scybala may bring on hyperemia, serous secretion, liquefaction of the intestinal contents, and abnormal gas production, which all accelerate peristalsis (stercoral diarrhea). Or the feces accumulate and become inspissated in the pouches of the colon and a central canal remains patent through which a daily evacuation takes place. A thin varnish-like coating of mucus over hard scybala does not mean catarrh, but is simply a local irritative hypersecretion.

Among gastric diseases ulcer, pyloric stenosis, hyperchlorhydria, and atony are most frequently associated with constipation, especially atony. Hence the necessity of examining the motility and chemistry of the stomach. The coexistence of gastric and intestinal atony is due to the same underlying causes. Hyperchlorhydria is frequently accompanied by constipation; the actual mechanism is not understood. We know from Strasburger's ingenious method of weighing intestinal bacteria (living and dead) that they are diminished in hyperchlorhydria. The latter may be a sequel of habitual constipation, probably induced by the habitual abuse of cathartics.

Enteroptosis is easily recognized by the habitus enteroptoticus described above, by bimanual palpation of prolapsed kidneys (nephroptosis), by the detection of a stomach-splash in an abnormal location, and by gastric transillumination (gastroptosis), by insufflation of the colon with air or gas, or filling it with water for the purpose of detecting a prolapse of the transverse colon (coloptosis)

A diagnosis of habitual constipation is not complete without a diagnosis of the etiology. A painstaking anamnesis and examination of the whole body will bring out the etiologic factors in most cases.

Let us recapitulate the most important diagnostic hints:

Do not overlook rectal and intestinal carcinoma.

Learn to recognize fecal tumors.

Remember the occurrence of stercoral diarrhea.

Recognize the coexistence of constipation and intestinal catarrh; weigh their interaction in each case.

Remember Trousseau's dictum that about one-half of the gastralgias originate in the *transverse colon*.

PROGNOSIS

The prognosis as to life is good. No one ever dies of constipation directly, but the sequelæ (intestinal obstruction and peritonitis) may prove fatal. It is worthy of note that the three surgical diseases most commonly calling for major operations, appendicitis, hernia, and hemorrhoids, are intestinal, and chronic constipation is frequently responsible for their development. Thus it is to be seen that habitual constipation is not a negligible factor.

As to cure, the prognosis is doubtful. A permanent cure is feasible in some cases; *i.e.*, natural action can be established and maintained where hitherto artificial means were constantly to be resorted to. But too often the disturbance recurs. Presupposing an intelligent conduct of the case, success is dependent largely on the patient's means and her personal character. Failures and relapses are frequently the result of a want of perseverance. Too often the condition is neglected and only comes under systematic treatment after the drug-habit or enema-habit has become firmly established or after organic changes have taken place. Prognosis is affected by the duration of the trouble and the age of the patient. Most essential of all is intelligent and willing co-operation of physician and patient.

PROPHYLAXIS

Prophylaxis ought to begin in the first year of life. The foundation for many a weak digestion is laid during that period. Intelligent nurses know how to coax infants into having their daily movements at regular hours. Children ought to be supervised as to that function. Boys and girls, especially of school age, must be impressed with the importance of the act and its regularity. They must be cautioned not to neglect the

calls of nature. Girls ought not to wear corsets too early. With them the habitual use of purgatives is especially disastrous and reprehensible. They should be brought up on a mixed diet and taught to drink water freely. These measures, the cultivation of regular habits, a common-sense mode of life, a common-sense dress, and avoidance of tight lacing are the best preventives of habitual constipation at all times. These measures must be insisted upon, especially in members of families where sluggish bowels are a family failing.

The pregnant state, which offers a special predisposition for the development of constipation, must be managed with a view to the prevention of this disorder. Much can be done by proper diet, outdoor life, and abdominal binders. Intelligent management of the puerperal state, as outlined in another section, will preserve the intestinal functions or restore them should they become disordered.

We heartily wish to recommend here the following simple gymnastic exercises, which ought to be commenced one week after delivery, provided the course of the puerperium has been perfectly normal. Patients lie flat on their backs and raise themselves to the sitting position without the aid of their arms and hands, and then gradually and slowly return to the recumbent position; the latter exercise must be done in stages during which the trunk is held through muscular action in various angles to the pelvis. It may be necessary to start with the latter exercise, in case patients are too weak to do the former first. The exercises are gradually increased up to ten to twenty times, two or three times a day. They can also be done against resistance. The change in the structure of the abdominal wall under these exercises is truly astonishing; from day to day we can feel the muscle bundles become broader and firmer and the interstices between them smaller. If this procedure is continued sufficiently long, the abdominal muscles may develop to such an extent that the wearing of a postpartum binder can be dispensed with.

Gynecologists ought to pay more attention to constipation. They see a great deal of it. Pelvic inflammatory disorders by inhibiting peristalsis may be responsible for constipation. Fre-

quently enough constipation causes pelvic congestion. Physicians ought not to be satisfied with a prescription for a cathartic, but should treat their cases as outlined under the next heading, and they should not dismiss a gynecologic case from treatment before they have done their best to cure the existing constipation.

The family physician must be, as in so many instances, the principal prophylactic agent. He must on all occasions warn his patients against the abuse of cathartics; he must combat the fallacious opinion that all sorts of minor ailments can be driven out by a good purge, or that the treatment of every acute disease must begin with a dose of salts.

Hospital and dispensary physicians ought to awaken to their therapeutic sins in this respect and to their responsibility in fostering the most common of disorders of civilized man, constipation, by the indiscriminate and injudicious administration of purgatives.

In dispensaries special therapeutic departments ought to be created where hydrotherapy, mechanotherapy, and electrotherapy are practised and where cases of habitual constipation are sent for special treatment, after their diet has been mapped out and faulty habits have been corrected by the attending physician, the latter to control the entire treatment. The creation of physico-therapeutic departments, while materially enhancing the value of dispensary treatment for all applicants, would especially benefit the large class of constipated patients.

TREATMENT

The treatment should be directed towards increasing the excitability of Auerbach's plexus. This goes to the root of the trouble, *i.e.*, the etiological factor is being attacked. Drugs play a minor rôle. This must be the leading sentence. It is high time that physicians became imbued with the truth of this statement. The treatment consists of hygienic, dietetic, and mechanical methods, and where they can be ascertained, demands the removal of etiologic factors. Each case is a law unto itself. The following points apply to the average case of simple hypoperistalsis:

1. **Habit.**—Patients should be told to keep regular hours, so far as possible, for rest, meals, and sleep, and above all, to go to

stool at a certain fixed time every day. Normally, intestinal innervation is so constituted that the mechanism of defecation is set in motion once a day at about the same time. Hence the institution of a stool-time is but natural. This idea is so simple that it is not sufficiently appreciated by physicians and patients. Every day at exactly the same time the patient should go to the toilet and try to have a movement. If the effort is ineffectual after a reasonable time, she should wait until the next day, even if she feels the desire during the day. If these efforts be futile on the second day, she should take at once an injection of lukewarm water. The same practice is repeated on the following days, only the water for the injection is taken at a colder temperature. This systematic repetition of the act, exactly at the same hour, usually brings on the desire at that particular time, and it is rare that this training fails of its purpose (Trousseau).

The best time is after breakfast, because the ingestion of food into the fasting stomach incites intestinal peristalsis. For some people it may be more convenient to go to stool directly upon rising, after drinking a glass of water. Others may select, for reasons of expediency, any other time of the day. Patients with hemorrhoids do best to have their hour for defecation in the evening, when they have time to lie down afterward and permit the prolapsed and engorged nodules to recede and become disgorged.

Many individuals have learned to move the bowels by various simple dietary measures, for instance, by drinking on rising, one of the following: a glass of cold or hot water, sugar water, black coffee, milk (especially raw), or orange juice; also by eating raw or cooked fruit. These articles of food do not act on the neuromuscular apparatus of the large bowel. Still, we know from experience and from clinical facts, that stimuli which affect the intestinal mucosa at a certain spot can produce peristaltic waves traveling downward from the irritated spot even into the large intestine. The duodenal mucosa is especially irritable. Sometimes the excitation jumps to the colon from a spot high up, by way of reflex, without affecting the intermediary parts. On the other hand, irritation of the anal region may suffice to set the entire peristalsis in motion. Such stimuli do not affect

healthy people, but many sufferers from diarrhea and many excitable neurasthenics. Among the latter there are some who are very anxious about the quantity, quality and temperature of their first morning meal, because they have a fear of developing diarrhea. This anxiety amounts to a phobia. The success of the above mentioned simple dietary measures can be explained on a similar basis. These persons are governed by a strong psychic element, much the same as children are educated to empty the bowels at specified times, and as adults can be trained to do so by suggestion in the waking or hypnotic state. This kind of constipation is caused by psychic inhibition and therefore is curable by discipline under the guise of simple dietetic measures.

2. **Diet.**—The natural treatment of all digestive disorders is dietetic. No case of habitual constipation can be corrected without a proper diet, but some by that alone.

(*a*) Avoid all substances which tend to constipate, such as tea, cocoa, chocolate, claret, blackberries and blackberry cordials, whortleberries (all on account of their tannic acid content), potatoes in quantity, rice, thick gruels (except oatmeal), burnt flour, and certain kinds of cheese which form a tough curd in the intestinal canal. (*b*) Select such substances as stimulate peristalsis either mechanically by the bulky residue which they leave behind or chemically or thermically. As a rule, a combined action is produced, such as by cabbage, salads, or other fresh vegetables, beets, carrots, asparagus, turnips, pickles, celery, radishes, olives, onions, sprouts, spinach, tomatoes, bran-bread, cereal meal, Graham-bread, Pumpernickel. The active chemical agents are either present as constituents of these foods or are added to them before consumption, or are evolved during their digestion in the alimentary canal. They are organic acids (lactic, butyric, acetic, carbonic, tartaric, and malic, or the lower fatty acids), sugar, and common salt. These physiologic alimentary cathartics are represented by the following articles:

Fruits, best given cooked or stewed and sweetened with sugar of milk, especially apples, prunes, figs, oranges, peaches, dates, grapes, grapefruit, melons, jams, marmalades,

treacle, honey, syrup, lemonade, grape-juice, pineapple-juice, cider, light white wine.

Milk, which constipates a few people but purges many, especially when taken raw and with the addition of salt to prevent the formation of a tough curd; buttermilk; kumyss; matzoon; sour milk, prepared by spontaneous souring or by means of zoolak or of yoghurt or by specially prepared lactic acid bacilli in the form of tablets; whey, prepared with rennet or cream of tartar.

Carbonated waters, beer, champagne.

Salted foods, such as herring, sardellen, caviar, ham, smoked salted beef; condiments.

Fats and oils act as lubricants, if they escape digestion, but principally by being split up into glycerin and fatty acids, some of which are volatile.

Of vitamins not enough is known to introduce them into the diet of the constipated. Yeast, which is particularly rich in vitamin B, regulates the bowels in some cases. Empirically, it has been found useful (in daily doses of one cake of the compressed article or as cerolin, the yeast fat, in 2-grain pills) in cases of constipation complicated by acne or furunculosis.

All substances from which we expect a chemical effect act better when not given on a full stomach and when interchangeably given from day to day.

From this large variety of anti-constipation foods and drinks we choose and combine those which seem best adapted to each specific case. Our choice must be governed by the circumstances of the patient, his tastes, his idiosyncrasies, his nutrition, the severity and duration of the trouble, the state of the digestive organs (hyperchlorhydria, atony of the stomach, tendency to flatulence), and by complicating diseases. Milk preparations and sweets are apt to give rise to flatulency. This wears off in time, or the patients get accustomed to it. But should it be excessive and troublesome, then we have to substitute the offending substances by others on the foregoing list. Altogether, the proper diet is a mixed one with a restriction of animal food and a preponderance of carbohydrates and fats. Kohnstamm believes that meat contains constituents

which inhibit peristalsis, and for that reason he eliminates meat entirely from the diet of constipated patients.

The grape-cure is used in certain European health-resorts with good effect for the relief of habitual constipation. Patients eat one pound of grapes (without the skins) the first thing in the morning, one pound before luncheon, and one pound before retiring—in addition to their regular meals.

The lemon-cure acts similarly and is more feasible. Patients take the juice of two to three lemons in a glassful of sugar-water three times a day. This is suitable for the gouty and obese.

The following is a diet list for a moderately severe case of hypoperistalsis:

Glass of cold water with a pinch of salt sipped the first thing in the morning on an empty stomach. One-half hour later:

Breakfast: Coffee with sugar and milk or cream; ham or bacon and a cereal breakfast-food, *e. g.*, cereal meal; rye or Graham bread with plenty of butter and honey or jam or marmalade.

Luncheon: Eggs or meat, vegetables, bread and butter; a glass of buttermilk or a dish of sour milk.

Supper: Broth, meat, plenty of vegetables and relishes, compot (prunes and figs mixed), bread and butter; two hours later a glass of beer or ale. The beer may be taken with the supper and the compot before retiring. Water is to be taken freely between meals.

Individuality plays a great rôle in the matter of diet. The intestines of different individuals are amenable to different alimentary stimuli, and these must be ascertained in each case, which may at times require patient study and skilful experimenting.

A coarse diet rich in residue ultimately becomes an educational factor acting etiologically in primary hypoperistalsis. It can be graded and adapted to the particular needs of the case. At least four weeks are necessary to accomplish a beneficial change. The dietetic and hygienic regime must conform to the patient's mode of living if we want it to be conscientiously continued.

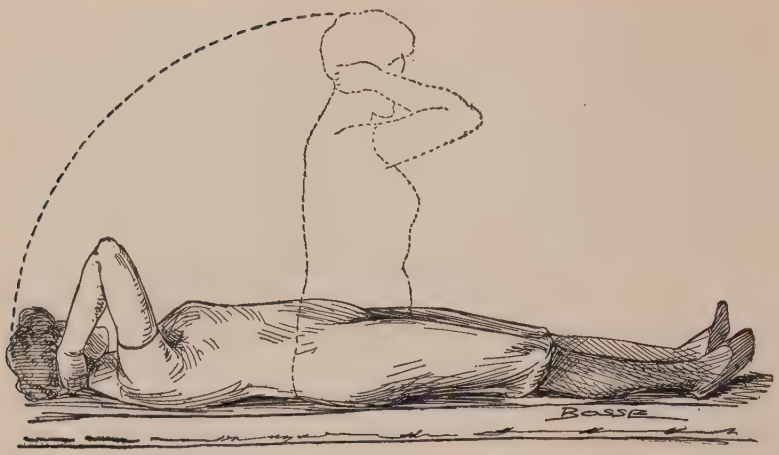


Fig. 119.—Raising the body slowly from the horizontal position, with the legs held straight and horizontal.

Fig. 120.—Bending the trunk forward from the body with the knees held stiff.

3. **Kinesiotherapy (Exercise Treatment).**—It is an old popular belief that people of sedentary habits are particularly subject to constipation and to stasis of the abdominal and pelvic vessels. Exercise in the open air increases the activity of the circulatory and respiratory organs, promoting appetite and sleep and thus improving neuro-muscular and glandular

Fig. 121.—The body is bent sideways from the hips.

Fig. 122.—The trunk is rotated on the pelvis.

functions. It has been shown that by walking after meals the stomach empties itself more quickly. All outdoor sports, if not exaggerated, are of benefit to the constipated; some more, some less. Rowing is best; horseback riding, swimming, bicycling, tennis, golf and bowling come next. Indoor gymnastics may be substituted or added (Zander apparatus,

rowing machines). The German system of "Turning" is excellent.

The following exercises are adapted for home use: Raising the body from the horizontal position on the floor to the sitting, and slowly returning; bending the trunk forward and back-

Fig. 123.—Side-bending and body rotation combined.

Fig. 124.—The thigh is flexed quickly against the abdomen.

ward with knees stiff; bending sideways; rotating the trunk on the pelvis; flexing the thigh quickly and sharply against the abdomen; settling down (Figs. 119, 120, 121, 122, 123, 124, 125).

Between these various acts breathing exercises are in place. The important point about these exercises is that they should be executed accurately, systematically, and steadily. They are done twice a day, upon rising and before retiring, from ten

to twenty minutes. The physician ought to show them or they may be taught from books. Adults are only too prone to lose interest and either give up or do them in a slipshod fashion.

Postural Treatment.—An adjuvant, in cases where the difficulty is in the rectum and pelvic floor, is the postural treatment. Such patients should be made to assume the crouching position during defecation by sitting on a vessel placed on the floor or by crouching on a high footstool placed in front of the water-closet, or they may cross their legs alternately, one over the other, and lean forward while sitting in the ordinary position. The action of the levator ani, torn during childbirth, can be partly substituted by the following manipulations: The hand is applied to the pelvic floor between anus and coccyx, so that the anus lies between index and middle fingers, and upward pressure is exerted during the act of straining.

Fig. 125.—Settling down.

Fecal accumulations in the rectum occur in the rectum type of constipation. They can be palpated from the outside in the depth of the anal recess and a little to the left of the median line. Patients can be taught to feel these accumulations; they can at the same time be taught to make deep stroking passes from the tip of the coccyx on the left side toward the anus and thus express the hard masses (Ebstein).

Massage.—Theoretically, massage of the abdominal wall does not seem to be a natural method of treating constipation. But in practice it produces results. Whether it acts only on the mind and expectations of the patient, or whether it really excites efficient contractions of the intestinal musculature and

trains the intestine to normal action, remains an open question. There are two forms of abdominal massage in use:

1. The greased hands are carried in small circular pushing motions from the cecum along the colon to the sigmoid. In addition, the rest of the abdomen is manipulated in various ways.

2. The hands are held stiff, the finger-tips being applied over the region of the cecum. Slightly increased pressure is exerted until the bowel is caught firmly between the fingers and the posterior abdominal wall. Then slight vibratory pushes are made. After one to two minutes the other parts of the colon are thus successively manipulated. An attempt is also made to grasp the colon between the hands and lift it up. Deep massage is applied to the flexures of the colon. The small intestine is similarly handled. Finally, the whole abdomen is shaken with the flat of the hands. This form of massage is more difficult and exacting on account of the greater resistance which the abdominal walls offer in the beginning, but it is also more effective.

Massage must be practised daily for fifteen to thirty minutes, best in the fasting condition or before retiring, and continued for at least four weeks, then every other day, then twice weekly, and so gradually discontinued. The principal point is to have it carried out by a skilful operator who has not merely a certain technic, but knows what she wants to do and what she can do in a special case. Therein lies the trouble with massage. Many practise it, but "few are chosen." There are too few physicians who have a thorough knowledge of massage; and still fewer who know how to do it. There is no reason why more of us should not learn it and rescue an important branch of therapeutics from the hands of irresponsible individuals.

For patients who cannot afford this form of treatment self-massage may be substituted. An iron ball weighing about 6 pounds, sewn up in flannel, is rolled over the abdomen along the course of the large bowel and around the umbilicus for five to ten minutes every morning under moderate pressure by the patient in the recumbent position. Or the patient, while sitting and stopping forward, exerts slight pushing motions against her abdomen with the finger-tips in the same direction as with the ball.

Massage develops and strengthens atrophic or overstretched abdominal muscles; although less efficiently than special gymnastic exercises.

Vibration.—Vibratory treatment is based on the same rationale as massage. It is indeed an integral part of some forms

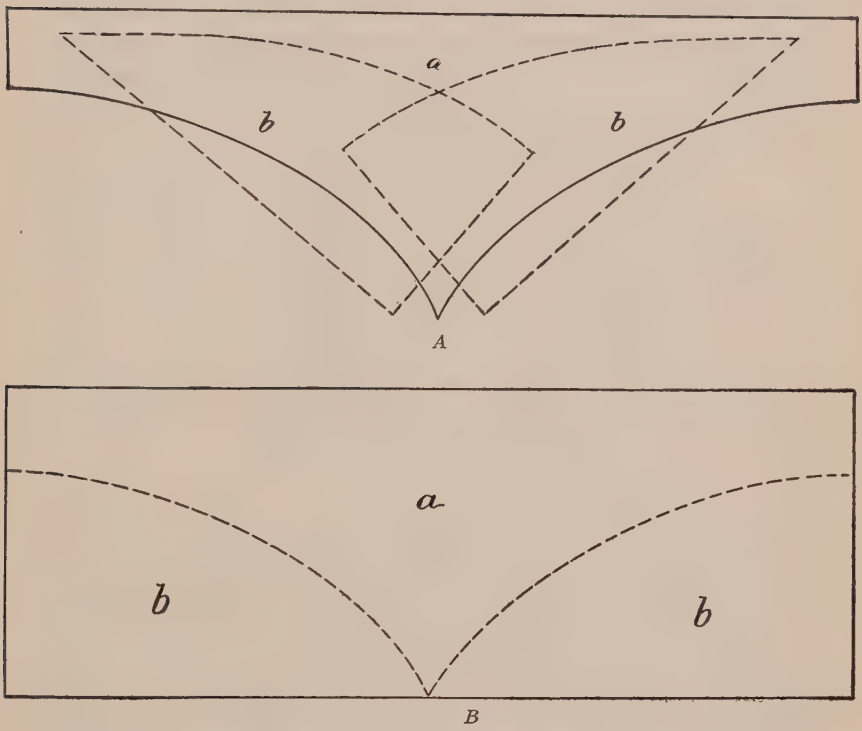


Fig. 126.—Rose's bandage. A piece of rubber plaster, of the average size of thirty-four by twelve inches, is cut as shown by the dotted lines in *B*. The large piece *a* is applied as tightly as possible around the abdomen, drawing it well upward, the two ends meeting or overlapping at the spine The plaster should not include the crest of the ilium, but should run closely along and above it. The support of the abdominal walls is made perfect by additional application of the two side-pieces of the plaster *b*, *b*, turned in a way as shown by *A*, extending from the hypogastrium over the inguinal and iliac regions, and reaching also to, or near, the spine. In applying the side-pieces we may employ considerable force.

of massage. But it is usually administered by means of special apparatus, so-called vibrators. The vibrations are given in short or long strokes and with variations of speed and duration. Thereby the effect is modified. Long-stroked vibrations of short duration increase muscular and neural excitability; they

have a stimulating, tonic effect. Short-stroked, rapid, and prolonged vibrations diminish excitability and have a sedative calming effect. The former mode of application is indicated in ordinary atonic constipation. The parts of the apparatus which are applied to the body (vibratodes) are of various shapes, generally hollow metal balls. These are carried over the abdomen in the same way as the hands of the masseur or the iron ball, used for self-massage. The vibratode can also

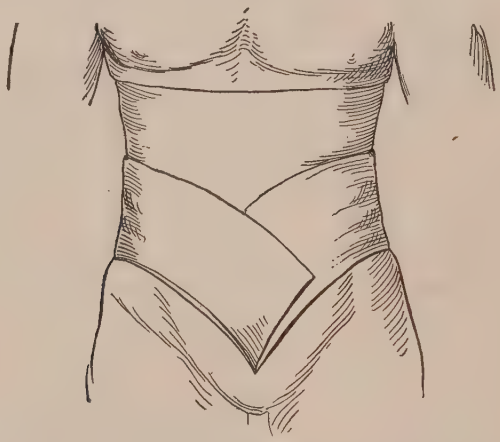


Fig. 127.—Rose's bandage. Most patients bear this plaster without complaining of irritation of the skin, even during the hot weather; a few suffer from itching, especially in warm weather, but not enough to require removal of the plaster; while a very few complain of eczema to such a degree that the plaster becomes unbearable, and has to be removed after a week or two instead of remaining on for five or six weeks, as in the majority of cases. In such instances we may protect the skin by first applying Dietrich's india-rubber plaster with zinc, and the ordinary rubber plaster on top of it.

be applied in the rectum, and is then shaped like a hard-rubber bougie.

Abdominal Supports.—For splanchnoptosis congenital or acquired, for pendulous abdomen, for hernia ventralis, a good abdominal binder should be worn. The object of the binder is to lift and support. It should be made of a material which is somewhat elastic but also resistant. It should retain its position under varying conditions. It must be fairly light and easily adjustable and must not spoil the figure, an important item with women. A combination corset and binder consists of a straight-front corset with elastic straps around the hips,

made to fit tightly at that point, while it fits snugly at the waist and loosely above. In cases of umbilical hernia an umbilical pad may be attached to the binder. Other special pads, such as the much vaunted kidney-pad for floating kidney, are worse than useless.

A. Rose's method of strapping the abdomen with adhesive plaster is highly recommended (Figs. 126 and 127). It has been proved by transillumination of the stomach and by the *x*-ray and bismuth-ingestion that these measures (Rose's plaster straps, Storm binder, etc.) really lift a sunken stomach several inches.

Electricity.—Electricity vies with massage in the treatment of habitual constipation. It is used in all its various forms with success. Cures have been effected by means of static-wave and the static-induced current and the sinusoidal current. We are most familiar with the old stand-bys accessible to all, the faradic and galvanic currents, and their combination, the galvano-faradic current. Although there is some difference of opinion among authors as to the effect of electricity in general, and on unstriped muscles in particular, the practical results in cases of habitual constipation remain undisputed. Peristaltic waves have been observed under the application of either current, in people with thin abdominal walls and in hernial sacs.

The currents are applied in various ways to suit indications. Usually one large electrode is placed in the lumbosacral region of the recumbent patient and another medium sized one is carried over the abdomen. In the region of the cecum it is applied with greater pressure and left for a minute; then it is carried along the colon to the sigmoid, where the same maneuver is repeated; then circular or spiral passes are made around the umbilicus. Currents must be strong enough to produce lively contractions of the abdominal muscles. These contractions, however, are not the only object of the application, as they prevent the penetration of the current. Hence the electrode is applied also away from the motor points with considerable pressure. At the end of a seance we allow the current to pass between two electrodes of the same size placed over the hypochondric regions. Where the pelvic floor is weak, one electrode may be applied over the

perineum. In overdistention of the rectal ampulla or in prolapsus recti one electrode is applied in the rectum. The cathode has a slightly greater stimulating action wherever applied.

For the faradic current a flexible metal sound covered with webbing up to the tip is used.

Fig. 128.—Flexible rectal faradic electrode.

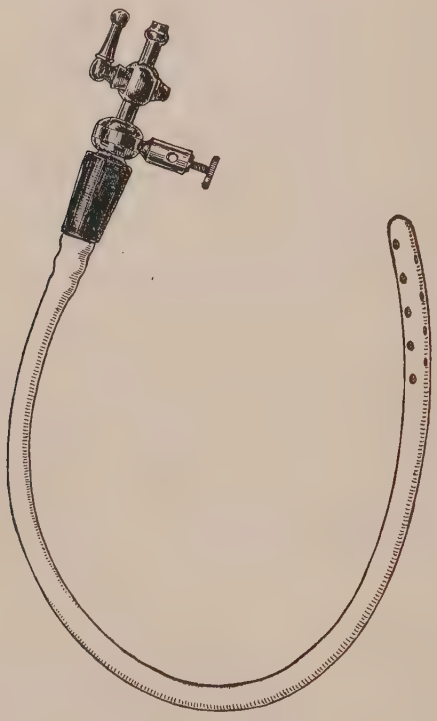


Fig. 129.—Boas' rectal galvanic electrode.

For the galvanic current we need the medium of water to protect the rectal mucosa and evenly distribute the current. Boas' electrode is very suitable (Fig. 129). A substitute may be improvised as follows: A soft-rubber catheter with numerous small holes is pushed over a copper wire electrode up to the tip, fastened, and then introduced into the ampulla, which has been

previously filled with warm salt water. A current strength of 20 to 30 milliamperes is used. The patient ought to feel a marked prickling sensation in the rectum.

The galvano-faradic current combines certain advantages. Here the induced current acts on organs which have been put into a state of increased excitability (katelectrotonus) by the galvanic current, thereby increasing the stimulating effect. Besides, galvanism refreshes the muscles and thus counteracts any fatigue and exhaustion which may follow strong faradization.

The ordinary galvanic or faradic current can be transformed into a sinusoidal current by attaching the two wires from the office-battery and passing the current through the sinusoidal current machine.

This consists of an insulated metal cylinder on which is wound a fine high-resistance wire. On either side of the cylinder are fastened two bars with sliding traveling contacts which are attached to a reciprocating device, driven by a small electric motor for those who have the street current and a spring motor for those who have the battery current. The sinusoidal current has the following characteristics:

The current of a given polarity increases from zero to a certain maximum, then drops back gradually to zero, when the polarity changes and a gradual increase and decrease of the current takes place, to be followed by an increase and decrease with the original polarity and so on. The strength of the current goes as far in one direction as in the other.

The constant change of polarity when using the galvanic current eliminates all electrolytic action; stimulation being the sole property of this kind of current. This current has no equal in its power to contract non-striated muscle fiber; it is therefore without a rival in all atonic conditions of involuntary muscles. It is well to remember the normal rhythm of the particular organ under treatment. This current should not have more than ten to thirty alternations per minute.

Electric treatment can, if necessary, be entrusted to intelligent patients, which is of advantage in some instances. Compared with self-massage, self-electricity is more valuable.

Hydrotherapy.—We use general and local, internal and external hydrotherapy in habitual constipation. We have already mentioned the importance of drinking water freely. We may add that gastric lavage or douching with normal salt solution (or Wiesbadner Kochbrunnen) has been recommended for the cure of this trouble. From ½ to 1 pint is allowed to run in and out by alternately raising and lowering a funnel connected with a stomach-tube. This procedure excites active intestinal peristalsis, and if practised daily for several weeks may accomplish permanent results. It is especially indicated in complicating nervous anorexia, nervous anacidity, and subacidity.

The introduction of water into the lower bowel is one of the most popular theraupeutic measures. It is performed in various ways and is easily modified according to the end in view. We may use small or large quantities of water of varying temperatures; in short or long intervals; under high or low pressure; in different positions of the patient and with various additions, as salt, soap, glycerin, oil. The most common indication is in the rectal type of constipation. Here the injection softens the feces, thereby facilitating their expulsion, and excites peristalsis of the lower bowel. The best and simplest form of an evacuating enema for an adult is the injection of about one pint of water at 80° to 95° F. with the addition of a little soap, administered from a fountain syringe in the recumbent position and retained as long as possible. These injections may be used over long periods of time without doing any harm. Or the patient injects 6 to 10 ounces of warm water with a teaspoonful of green soap or glycerated soap and retains it overnight, whereby hardened masses are softened and peristalsis of the lower bowel is greatly excited.

Of external local applications we employ abdominal douches, compresses, and sitz-baths or hip-baths Sitz-baths or hip-baths powerfully influence the innervation of the abdominal and pelvic organs and the capacity of the abdominal vessels, the largest blood-reservoir of the body, the filling of which to a great extent controls the general circulation and blood-pressure.

Cold or very hot hip-baths contract the abdominal vessels, driving the blood to other parts, as evidenced by congestion of the head, increase of axillary temperature, lowering of the rectal temperature. If this thermic irritation lasts but one to three minutes, prompt reaction ensues, that is, active hyperemia of the abdominal organs takes place.

Short, cold hip-baths from 50° to 68° F. are therefore indicated in all conditions of the abdominal organs which are due to anemia, venous stasis, motor and secretory insufficiency, torpid metabolism; for instance, in atonic constipation.

Abdominal compresses, in the shape of wet dressings (Priessnitz compress, Neptune's girdle) worn overnight, allay the manifold unpleasant sensations which interfere with the comfort or sleep of patients suffering from organic and functional gastro-intestinal disorders.

A Scotch douche, *i. e.*, alternating hot and cold, jet and fan douche on the abdomen, is a powerful stimulus to peristalsis. The same effect is produced by the ether-douche (Boas): once or twice a day for about five minutes the abdomen is sprayed from an atomizer with 100 c.c. pure sulphuric ether.

All these local applications are very advantageously combined with general hydriatic procedures. Thus the short, cold hip-baths are preferably followed by a douche of gradually reduced temperature or a Scotch douche on the abdomen, and later by a stimulating douche to the entire surface. Affusions of the abdomen of cold water from a good height are preferably combined with half-baths of 85° to 80° F. It is positively established that the best effects of hydrotherapy are brought out by applications to the entire surface, viz., its effect on circulation, respiration, and innervation, secretion, and excretion.

General hydrotherapeutic procedures find their greatest field of usefulness in chronic disorders of the gastro-intestinal tract, especially the functional ones, be the latter a manifestation of neurasthenia or hysteria, or the primary cause of the disturbance of the cerebrospinal centers. Such measures are graduated douches (circular, jet, and fan douche) of one to two minutes' duration and 30 to 40 pounds' pressure, preceded by

artificial warming of the body and followed by friction—best carried out in special institutions.

For home use the following measures are indicated:

Ablutions by means of a rough towel, a bath glove, or the hand with water at 80°, reduced gradually two degrees each day down to 60°; affusions with water at the same temperature; the drip sheet from 70° to 50°, followed by a half-bath from 85° to 80°. We employ one or other of these applications, according to whether symptoms of irritation or depression predominate in the particular case and whether the patient is poorly or well nourished, anemic or plethoric. The great advantage of hydrotherapy is that it can be so modified as to suit almost any case and condition where it is at all indicated.

So-called Spastic Constipation.—The importance of the spastic element in a particular case must be gauged by the entire clinical picture, the personality of the patient, the appearance of the stools, and by repeated x-ray examinations. Everything must be done to allay spasm and soothe an overexcited nervous system. Cold hydriatic procedures are contraindicated. Warm full baths or sitz-baths, or a hot water bag on the abdomen, are very acceptable; also injections of warm water with the addition of aromatic substances, or the drinking of large quantities of hot peppermint, fennel, or chamomile tea. Electricity and massage are out of place. The diet should not contain coarse substances which act mechanically through a bulky residue, but chiefly such as exert a chemical action. Much rest is essential for these cases, even resting in bed. A change of scenery is often of great benefit. Sanatorium regime generally surpasses home treatment. Unfortunately, on the return of the patient to the vexations of his daily routine, the old symptoms are apt to relapse.

Oil enemata find here their greatest usefulness, more so than in the ordinary form, where they are also largely used, and justly so. About 8 ounces of warmed pure oil (olive or the cheaper sesame oil) are introduced into the bowel by means of a rectal tube and funnel or a hard-rubber hand syringe (4 ounces) applied by the patient himself or by an attendant. The patient should lie on the back or the left side

with the head low and the pelvis high, and not rise for some time after the injection, in order to give the oil an opportunity of evenly distributing itself over the colon. (It has been found at operation oozing out from a perforated appendix.) It is therefore best given after retiring; every night for two weeks, then every other night for one week, then every third night for one week, then twice a week, then gradually discontinued. If 8 ounces act too strongly, the quantity should be reduced; if not acting sufficiently, it is increased. Should there be no movement after breakfast the following morning, a small injection of warm soapsuds is administered. There will be no soiling of the bed if the injections are given *lege artis*. Where one is not sure of that, we advise the wearing of an anal pad held in place by a T-binder.

In spastic constipation drugs are frequently needed, not the usual purgatives but rather sedatives. The general nervous system must be quieted down by bromids, from 0.5–1 g. (gr. 7½–15) t. i. d. or tincture of valerian, 2 c.c. (ʒss) alone or combined with bromids, or luminal 0.03 g. (gr. ½) every 3 hours. We have repeatedly heard patients assert that under a course of bromids bowels formerly sluggish resumed natural action. Opiates should not be given. Atropin paralyzes the vagus-endings and is therefore the logical remedy for spasticity. The dosage must be individual. The average is 1 mg. (gr. $\frac{1}{60}$) at bedtime and ½ mg. (gr. $\frac{1}{120}$) in the morning. Eumydrin (atropinmethylnitrate) in the same doses is better borne by some. It is difficult to handle atropin and ascertain the smallest effective dose. But when this has been found, it should not be increased, but the drug should be administered in diminishing amounts, even after all signs of spasticity have disappeared. During this period the diet must be restricted to foodstuffs that are absorbed in the small intestines, like milk, milk foods, fine cereals, white bread, butter, eggs, tender meat.

Suggestion plays a great rôle in the treatment of the sick. We have already spoken of the necessity of the formation of a regular stool habit. This is psychic treatment. In very obstinate cases of habitual constipation which have resisted all therapeutic endeavors, hypnosis has effected cures. It is

indeed regrettable that hypnotism is practised by irresponsible people, and that so much mystery and charlatanism are being attached to it.

Psychotherapy has made much progress in this country. It achieves its greatest triumphs in functional derangements. We do not doubt that many cases of habitual constipation would be amenable to this treatment.

Medicinal Treatment: A. Hormones.—Occasionally the administration of *thyroid* or *pituitary* extract improves a sluggish peristalsis, particularly in persons who are otherwise aided by these incretory products. The results, however, are neither startling nor lasting. Hormonal as originally prepared by Zuelzer from spleen tissue was not successful. The Neo-Hormonal of Zuelzer seems to be an improved product. One or two hypodermic injections have regulated the bowels for weeks and months, in a few exceptional cases.

B. Drugs.—The guiding principle should be to do without cathartics wherever possible. We do not absolutely oppose the use of drugs, but we advise their employment only on good indications. Let use bear in mind two simple facts: First, that there is no fundamental difference between the laxative effect of stewed prunes from the kitchen and that of tamarinds or manna from the drug-store. Second, not a few individuals take their daily dose, year in, year out, with good effect and without harm to the system or aggravation of their intestinal sluggishness.

Purgative drugs are indicated in the treatment of habitual constipation.

(*a*) In the beginning of a systematic cure, in the case of drug habitués.

(*b*) Where the hygienic, dietetic, and mechanical treatment is ineffective.

(*c*) Where such treatment cannot be carried out.

(*d*) In the aged, whereas in children and adolescents their habitual use cannot be too strongly condemned.

(*e*) In complicating diseases, chronic heart disease, arteriosclerosis, kidney disease, diabetes, plethora, during pregnancy and acute intercurrent conditions requiring rest in bed.

Whenever compelled in these cases to use drugs, we should observe the following rules:

1. Always select the mildest aperients; avoid drastics.
2. Find out the proper dose.
3. Use them intermittently; *i. e.*, try from time to time to omit them and get along with the physiologic methods.
4. Change off between the various suitable remedies so as to avoid habituation and an accumulation of unpleasant by-effects.
5. Select those which produce soft, abundant movements without inconvenience.
6. Give them in a pleasant convenient form.
7. Combine several of them if you see fit. (Single drug prescriptions may be highly scientific, but are often impractical.)

Laxatives proper act either by direct chemical stimulation of Auerbach's plexus or by moistening and liquefying the feces through increased glandular secretion or transudation of water into the bowel.

Medicinal treatment has only a symptomatic and transitory effect, but when properly managed may ultimately train the neuro-muscular apparatus of the bowels.

The following drugs are at our disposal for prolonged use:

Castor oil, rhubarb, senna, aloes, podophyllin, cascara, sulphur, salts, and a few modern preparations, such as purgatin, purgen, exodin, regulin. Their choice is governed by their pharmacologic action and by the requirements of the case. They all act ultimately by stimulating peristalsis. Occasionally and for special reasons calomel or one of the drastics may become necessary, like jalap, colocynth, scammony.

Oleum ricini (1 dram to 1 ounce) is perhaps the mildest of all, tasteless when given in large soft capsules, and rarely fails. It passes the stomach unchanged and is split up and saponified by the bile and pancreatic juice; a part of it escapes unchanged into the lower parts and acts as a lubricant. It can be given even in complicating catarrhal conditions and is especially indicated where constipation and diarrhea alternate and colic is frequent.

℞. Ol. ricini.
Syr. rhei. aromat.....āā ℥j (30.0)
S.—℥j (4.0) every three hours.

Rhubarb, senna, and cascara contain as active principle cathartin or cathartinic acid, an acid colloid glucosid which is split up by the pancreatic juice into chrysophanic acid and emodin, both anthracen-derivatives. The former is excreted in the urine and gives rise to a red or, in the case of cascara, a stronger yellow color on addition of an alkali.

Rhubarb.—Some patients chew a piece of the root daily for indefinite periods with good effect. The drug contains a bitter principle to which its action as a stomachic is due, and a special tannic acid which accounts for its constipating after-effect. It is often combined with other aperients, like castor oil, aloes, or salts.

Pil. rhei co. (U. S. P.) contains about gr. ij (0.13) of rhubarb, gr. iss (0.1) of aloes. Two are taken at night. It acts in ten to twelve hours.

℞. Pulv. rad. rhei ..... ℥j (30.0)
Sod. sulph. ..... ℥j (30.0)

Or

℞. Pulv. rad. rhei ..... ℥j (30.0)
Potass. bitart. ..... ℥ij (60.0)
Sulphur. sublim. ..... ℥ij (60.0)
S.—℥j at bedtime.

Our domestic rhubarb-plant possesses no laxative properties.

Senna.—Acts in three to four hours when given alone in full doses. It is the active agent in most of the popular teas and nostrums.

Pulvis Glycyrrhizæ Compositus (U. S. P.) is used extensively. We prefer to give it to patients suffering also from chronic bronchitis and emphysema. It was formerly used as an expectorant on account of its containing licorice and sulphur. Dose, ℥j (4.0).

Syrupus Sennæ Aromaticus (N. F.) and *Syrupus Sennæ Compositus* (N. F.) are pleasant and appropriate. A few senna leaves placed in a muslin bag and stewed together with prunes impart to the latter its cathartinic acid and materially enhance their laxative action.

Infusum Sennæ Compositum (U. S. P.) contains, besides senna, twice the quantity of manna and magnesium sulphate,

and is only adapted for occasional strong action, *e. g.*, in the lying-in period, when it is very effective in 2-ounce doses.

Cascara Sagrada.—At present perhaps the most popular laxative prescribed by physicians. It acts mildly during the night. The dose of the fluidextract (℥ j) can be easily regulated according to the effect produced, a great advantage when we wish gradually to wean an habitué. The solid extract is given in 2- to 5-grain pills (0.12 to 0.3).

Aloes: is an ingredient of almost all patent pills and of many of the officinal preparations.

Pilulæ Aloes (U. S. P.).
Pilulæ Aloes et Mastiches (N. F.).
Pilulæ Aloes et Myrrhæ (N. F.).
Pilulæ Aloes et Podophylli Compositæ (N. F.).
Pilulæ Aloini Compositæ (N. F.).
Pilulæ Aloini Strychninæ et Belladonnæ (N. F.).
Pilulæ Aloini Strychninæ et Belladonnæ Compositæ (N. F.).
Pilulæ Laxativæ Post Partum (N. F.).

The multiplicity of these officinal pills testifies to the good qualities of aloes and its active principle, aloin. They act exclusively on the large bowel in from twelve to fifteen hours. Bile seems to be necessary to bring out the effect. There is apparently no habituation and no increase in dosage necessary. In full doses aloes produces hyperemia not only of the lower bowel but of the pelvic vessels, which precludes its employment during pregnancy and the puerperium and permits of it only in small doses during menstruation.

Podophyllin.—A reliable purgative in doses of gr. ¼ (0.015), laxative in doses of gr. $\frac{1}{10}$ (0.006) as resina podophylli U. S. P. It is rarely used by itself. It is a good cholagog.

Sulphur, given in dram doses, in the form of sulphur lotum, sulphur precipitatum (milk of sulphur), sulphur sublimatum (flowers of sulphur), or as the popular sulphur and molasses, or combined with salts, *e. g.*, cream of tartar. When finely subdivided it passes the stomach unchanged and is transformed in the intestines into hydrogen sulphid and then into potassium and sodium sulphid, strong peristaltic stimulants. But as this change is very gradual there is no purgation; the feces are

simply rendered soft. Hence its popularity in hemorrhoidal troubles.

It appears from the above prescriptions that combinations are much in vogue, that there are enough official formulas to suit almost any condition, and that physicians have, therefore, no justification or excuse for prescribing patent or proprietary preparations if they do not want to make combinations of their own.

The following drugs are frequently combined with purgatives proper:

Strychnin sulphate (gr. $\frac{1}{60}$ to $\frac{1}{30}$) or extract of nux vomica, up to ½ grain in one pill, for its general and local tonic effect.

Atropin sulphate (gr. $\frac{1}{100}$ to $\frac{1}{50}$) or extract of belladonna up to ¼ grain, or extract of hyoscyamus up to 1 grain, to combat spasm or prevent griping.

Physostigmin salicylate (gr. $\frac{1}{60}$) or extract of physostigma (up to gr. $\frac{1}{6}$), to prevent or combat meteorism.

Pulvis capsici up to gr. 1, to stimulate gastric secretion.

Asafetida, myrrh, mastiche, in 2-grain doses, or the various ethereal oils in drop doses to prevent flatulence.

As previously mentioned, rhubarb, senna, rhamnus, and aloes contain anthracen-derivatives as active agents. An attempt has lately been made to manufacture synthetically anthracen-derivatives with purgative properties. The result of these endeavors is purgatin or purgatol and exodin. Purgatin, a light yellow powder, insoluble in water, produces good evacuations without griping, in twelve hours if given in doses of 8 to 30 grains (0.5 to 2.0); it colors the urine a Burgundy red.

Exodin, a greenish-yellow tasteless powder, insoluble in water, made in 7½-grain (0.5) tablets, is highly lauded by Ebstein as an adjuvant to oil-enemata in fecal impactions.

Purgen, the well-known indicator phenol-phthalein, is sold in tablets of 0.05 to 0.1 to 0.5 g.; it colors the feces red. It enters into the composition of many popular medicines. It is not harmless on prolonged use.

Salts.—Sulphate of soda (Glauber's salt), sulphate of magnesia (Epsom, bitter salt), phosphate of soda, oxid and car-

bonate of magnesia, bitartrate of potash (cream of tartar), tartrate of potash and soda (Rochelle salts), Sal Carolinum factitium (N. F.) (Carlsbad salts).

They stand between the mild aperients, calomel and castor oil, on the one hand, and the drastics on the other. They are absorbed with great difficulty from the stomach and intestines. They hold the water in which they are dissolved and prevent its absorption. The contents of the small intestine arrive in the colon in the fluid state and here escape inspissation, as the greater part of the salts remains unabsorbed and passes out. They furthermore mildly stimulate the intestinal mucosa and thus reflexly excite peristalsis. They should therefore be given diluted, preferably in the form of the natural mineral waters. They should not be given to bed-patients for long periods because with enforced rest the stomach does not empty itself promptly, and the salts are retained and depress the secretory functions of the stomach.

For systematic use Glauber, Epsom, and Carlsbad salts are best administered in the fasting state, followed by a walk or some exercise, which accelerates their action. This is the common practice at health-resorts. These drinking-cures do not cure, they do not affect the underlying condition of habitual constipation, they are merly palliatives. In sending our well-to-do patients to Marienbad, Karlsbad, Tarasp, Kissingen, and Saratoga, we desire them to reap the added benefits of the many coincident factors of such a cure.

Lean and weakly individuals, old people, convalescents, lying-in women, should not use the "middle salts" for prolonged periods, because with the accelerated passage of the intestinal contents much water and nutritive material passes out and is lost. Salts and mineral aperient waters are better adapted for fat or plethoric individuals, for whom this incidental effect is rather an advantage. The various salts are selected according to their additional pharmacologic properties which may be desirable in a special case of habitual constipation. Thus, magnesia usta and carbonica are given when we wish to neutralize a surplus of hydrochloric acid in the stomach; cremor tartari, when we wish a mild diuretic action; phosphate of soda

for its action on the liver, and for its supposed inhibiting action on the symptoms of Graves' disease. The sulphate of sodium and magnesium carry out of the system a great deal of water, not only the water needed for their own solution but also that present in the intestinal tract, and are therefore indicated in congestion of the abdominal viscera and in inflamed hemorrhoids, as well as in renal insufficiency (vicarious action). They are supposed by some to have a specific antitoxic effect on intestinal autointoxications, a still unproved hypothesis. After all that has been written on the subject, one fact stands out prominently, namely, that a good purge is the best intestinal antiseptic.

Magnesium sulphate in 15-grain doses, together with 3 drops of aromatic sulphuric acid or dilute hydrochloric acid, every two or three hours, is a favorite remedy in lead poisoning, in uncinariasis, and in dysentery.

Carlsbad salts are composed of sodium chlorid 18 per cent., sodium bicarbonate 36 per cent., sodium sulphate 44 per cent., potassium sulphate 2 per cent., a happy combination which fulfils various indications. Being devoid of irritating properties, they can be given in gastric ulcer with hyperchlorhydria for their antacid effect; but they are especially indicated in catarrhal conditions of the intestinal tract, which are not infrequently associated with habitual constipation, and especially in catarrh of the duodenum and of the large bile-passages. This explains their helpful action in catarrhal jaundice and in cholelithiasis (indirect cholagogs). Their popularity in gout and diabetes is due to their "salt" and "alkali" effect, which are supposed to increase the oxidation processes in the system.

Nearly all salines can be given in the form of effervescing solutions whereby their palatability is improved and their purgative effect enhanced through the action of the carbon-dioxid gas.

Regulin and pararegulin are preparations introduced by A. Schmidt for the regulation of sluggish intestinal action, due to an unusually vigorous digestion and assimilation (*cf.* Etiology). Regulin is agar-agar with 20 per cent. cascara extract; it is non-absorbable, swells up in the intestinal canal, and acts princi-

pally by its bulk and by its retention of water. Pararegulin is liquid paraffin with 10 per cent. cascara extract, given in teaspoon doses.

The rationale of such popular remedies as vaselin, linseed, or the French grains de lin de Jarin is based on the same principle.

Small doses of pure cultures of coli bacilli in capsules have also been recommended, on the supposition that the bacterial flora, when made sufficient, produces the proper amount of fermentative and putrefactive substances necessary for natural peristalsis. A similar idea underlies Metchnikoff's plan of gradually supplanting the ordinary intestinal bacteria by lactic acid bacilli. This may be brought about by the prolonged daily consumption of sour milk.

The bacillus acidophilus, in the form of tablets, capsules, or in liquid culture (one tablet, capsule or tablespoonful t. i. d. before meals) is known to become implanted in the human intestine and maintain life therein, even though it is not introduced any longer than a month, if only sugar, especially milk sugar, is supplied. Its use is particularly recommended in cases of constipation with autointoxication.

FIG. 130.—Radium-enamation-activator (Courtesy of Radium Limited).

The drinking of radium-water for several months has often removed a constipation together with the gouty manifestations for which the radium was originally prescribed. Radium-water is conveniently prepared in the Radium-emanation-activator (Fig. 130).

The rectal application of drugs deserves special consideration. We have already mentioned the use of enemata containing salt, soap, glycerin, oil. We have discussed oil-enemata. Boas recommends instead an enema consisting of 8 ounces of water, a small amount of baking soda, 2 tablespoonfuls of cod-liver oil, and 2 tablespoonfuls of castor oil, the whole well emulsified.

Glycerin is used extensively either in suppositories or, if a stronger or more certain action is required, in tablespoon doses by means of a special syringe. Glycerin acts as an irritant to the rectum on account of its hygroscopic properties. Magnesium sulphate, dissolved in water, is given per rectum alone or with glycerin, oil, soap, or oxgall.

Aloin (gr. 6), cathartin (gr. 8), colocynthin (gr. $\frac{1}{6}$), citrullin (gr. $\frac{1}{3}$), dissolved in a little water or dilute alcohol or glycerin and injected into the rectum (micro-clysters), are said to produce prompt evacuations even in obstinate cases. These drugs are expensive, except aloin, which may also be given in suppositories.

For prolonged use only pure oil or emulsions of oil and perhaps of glycerin are approved.

Flatow has recommended the insufflation of 1 dram of boric acid into the rectum by means of a powder-blower; this is worthy of trial. The drug can also be given in the form of suppositories of 15 to 45 grains (1.0 to 3.0).

Rectal bougies, 1 foot long, of hard rubber with a central channel, are also used for the relief of habitual constipation. They mechanically excite rectal peristalsis and overcome sphincter spasm. Hence their indication is limited.

Old hardened masses sometimes have to be taken out of the rectum with the fingers or by specially constructed spoons or scoops.

The operative removal of hypertrophic rectal folds is merely mentioned for completeness' sake. If they really do cause constipation, it is a secondary or symptomatic form and does not strictly belong to our subject.

Major operations have from time to time been proposed and performed for the cure of habitual constipation, especially when it is combined with symptoms of autointoxication. Adhesions have been severed; parts of the colon have been fixed (colopexy for ptosed colon, cecopexy for cecum mobile); anastomoses have been made between the end of the ileum and the transverse colon or the sigmoid (ileo-sigmoidostomy); and in addition the entire colon has been excised. These operations have not stood the test of time and have been practically abandoned.

Résumé.—What measures shall we use in a specific case of constipation? This depends entirely upon the nature of the case and on special circumstances. We must individualize. A mild case in a young person may be cured by the correction of faulty habits, training, and the institution of a proper diet. Gymnastics are next in order. Then a course of oil injections should be tried.

More severe cases require, in addition, massage and electricity.

It does not depend so much upon the method which is used as upon its methodical and prolonged employment.

In obstinate cases we combine dietetic and mechanical means with hydrotherapy. We employ drugs only on the strictest indications. We administer the smallest effective dose, we gradually diminish that dose, we gradually substitute the medicinal stimulus by alimentary stimuli, and institute psychic training to punctual defecation. It is through the choice and combination of the proper measures that skill, experience, and medical instinct triumph.

Unfortunately, relapses are common after apparent cures, either because patients slide back into the faulty habits responsible for the constipation or because they do not care to abandon the pill which so nicely moves their bowels, for measures which are more troublesome. On the other hand, cures are not permanent or complete because patients expect to be cured quickly and without inconvenience, and do not appreciate that a systematic course of treatment or an entire change in their mode of living are required.

Vulvovaginitis.—A purulent vulvovaginitis is not very rare in children. It is due, in the majority of cases, to the gonococcus.

On inspecting a specific case there will be seen a profuse yellow-green discharge, which accumulation is greatest in the upper portion of the vulva and about the clitoris, in which area the discharge is also thicker and drier. The vulva itself, external to the large labia, is red, inflamed, and edematous, pitting on pressure. The excoriation is more pronounced in the immediate circumference of the hymen, on the inner lining of the small labia, and on the perineum and fourchet. The sulci between the smaller labia and the future labia majora are much involved, being of a very dark red color, often having a deep bluish tinge. The vagina is generally infected. If treatment be devoted to the vulva alone, improvement is therefore relatively slow. The opinion of many that the specific form is simply a vulvitis and not a vaginitis is decidedly wrong. While this is true in some cases, it is by no means the rule, which can be disproved by first washing the vulva and outer end of the vagina thoroughly and then observing the expression of pus from the vagina when the child cries or resists efforts at treatment.

The most conspicuous lesion in gonorrheal vulvovaginitis is the inflammation immediately about the hymen, on the inner surface of the labia, and on the perineum. Frequently the cutaneous covering of and about the external genitalia is likewise affected. No matter how thoroughly the deeper vulvar lesions are treated, unless the entire skin periphery receives due attention secretion will continue. The reddening of the skin covering of the vulva is due not alone to irritation by the secretion, but also to an actual destruction by the gonococci of the superficial layers of the epidermis. During the acute inflammatory stage the area surrounding the clitoris is least affected.

Etiology.—Infection may come from contact with linens, towels, and sponges used by adults or children suffering from gonorrhea. In hospitals, infection of children in the wards is readily transmitted in this way. The hands of nurses who attend to an infected case and then, without sufficient precaution, arrange the toilet of the next child may convey an infection from the former to the latter. The use of the same thermometer on several children in succession may also be the source of infection, for the thermometer is probably often passed over the vulva or even into the vagina in an attempt to take the rectal temperature. Care is necessary, in the first examination, to determine if any attempted violence has produced local lesions beyond those of the infection—a factor which often explains the etiology. It is by no means easy to determine this fact, for penetration of the vagina need not occur. An attempt may have been made without injury or penetration. A useful method, however, is the irrigation of the hymen with a large stream of water under mild pressure. The normal hymen is then brought into undulation and its margin is distinctly outlined. Any tears or lesions will be evident as irregularities or interruptions in the normal unbroken edge of this structure.

Histopathology.—When gonococci grow on a mucous membrane they pass down between the epithelial cells, to the connective tissue. There is a decided exudation of leukocytes from an extensive periphery into the connective tissue and through the epithelium. The character of the epithelium makes a vast difference in the susceptibility to gonococcal invasion. In adults the urethra and cervix are readily infected because the cocci pass down easily between the cells arranged in palisade form. The vagina in adults is but slightly involved, because the surface epithelium is hard, dry, not arranged in palisade form, and therefore not readily entered. In the case of squamous epithelium, the softer and thinner it is, the more easily does the gonococcus penetrate it. That is why the tender covering of the vulva and vagina in children is always invaded. Mandl found in sections made through the vaginal mucosa in a case of gonorrheal vaginitis: (1) surface epithelium gone; (2)

all the epithelium gone in spots; (3) gonococci entering into the epithelium in rows and bands; (4) the gonococci very deep in the tissue in spots and extending beyond the epithelial limit. Though the gonococci were generally in the superficial connective tissue, in certain areas they were deeply embedded. The granular character of the vagina, in the gonorrheal vulvovaginitis of children, makes it evident that the pathology of the lesions is the same as in adults.

Examination of the Vagina.—Owing to the admirably reflected light of the Ferguson speculum, I have devised a smaller speculum on the same plan, which is used for the same purpose in children. A fairly large Kelly endoscope may also be used in the same manner. It is remarkable how distinctly the color and the character of the vaginal lining may be seen through the small speculum, and the small cervix, with its tiny opening, can be distinctly brought into view. In this way too, applications of fluid or the use of a swab may be carried out in the same manner as in adults, and a vaginal bath with any desired liquid may be given with the greatest of ease, limiting its action completely and preventing any accidental irritation of the vulva, perineum, vestibule, or urethra. By using the small speculum (Fig. 55) the red and inflamed character of the vaginal lining and the erosion of the tiny cervical os and the presence of cervical pus are very distinctly recognized.

Involvement of the anus and rectum may occur. In some cases purulent secretion is found exuding from the anus and examination shows the presence of gonococci, with involvement of the rectum. Ulcerations result, often accompanied by the passage of blood, on the basis of which the diagnosis of proctitis is made. In other instances the lesions are of a more acute character. Minute fissures are present in the anal margin, causing pain and the passage of blood on defecation.

Condylomata.—Continued irritation of the tissues leads to the same local anatomic lesions as occur in adults. Condylomata may be found on the perineum, on the large labia, and especially on the skin surrounding the clitoris, which in children is relatively large and thick. Condylomata may also be found in the neighborhood of the anus.

Involvement of the Urethra and Bladder.—The urethra is not rarely involved in the gonorrheal process. That the bladder may be involved is shown by a case of purulent cystitis in a nine-year-old child, in which Wertheim found only gonococci. Gonococci were obtained in the cultures made from an excised piece of the bladder mucosa. Microscopic examination of the specimen showed: (1) gonococci between the epithelial cells; (2) gonococci extending in rows into the subepithelial connective tissue and lying almost entirely extracellular; (3) the surface of the mucosa covered with fibrin layers; (4) gonococci in the blood-vessels.

The uterus, tubes, and peritoneum may be involved in children. Through upward extension of the gonococci there may occur purulent involvement of the tubes, and pus is then poured out into the peritoneum, producing pelvic or even a general peritonitis. Such cases in children of five, six, seven years of age and older are generally diagnosed as appendicitis. In every case of peritonitis in female children a vulvovaginal discharge should be looked for and a microscopic examination should be made. Goodman says: "Wertheim noted that peritonitis produced by the gonococci is accompanied by a greater exudate than that produced by other organisms. A child thus affected becomes feverish and looks ill. The temperature is generally not high, ranging between 100° and 102°. The pulse may be as high as 140. There is often vomiting and abdominal pain. The abdomen is unusually distended and tympanitic. No tumor can be felt. The rigidity of the recti is not marked. The picture is that of a general peritonitis, but to the clinical eye it does not carry the same conviction of severity as noted in severe appendicitis or intussusception. Some observers, however, mention the sharp and intensive onset and the serious aspect. The intestines are distended and injected. There is seropurulent fluid, there is pus in the pelvis, there are accumulations of lymph on some coils of the intestines." A diffuse gonorrheal peritonitis generally progresses favorably, with palliative or symptomatic treatment. Operation may be deemed necessary if the severity of the onset suggests a mixed infection. In a collection of eighteen cases of diffuse general

gonorrheal peritonitis in which the gonococci were found on operation (collected by Dr. Chas. Goodman) the mortality was 11 per cent. In the mixed infections there may be involvements of the lung, such as broncho-pneumonia or empyema, but these do not occur with pure gonorrheal peritonitis.

In other cases closure of the abdominal end of the Fallopian tubes takes place and varying degrees of pyosalpingitis may result. A not infrequent sequela of the milder extension to and involvement of the peritoneum and ovaries is the formation of tubo-ovarian cysts with marked adhesions, which may give no symptoms until the child reaches the period of menstruation or later.

Constitutional involvement may occur from any point, in the form of endocarditis, joint or periosteal involvements, and even meningitis.

Treatment.—In the treatment of vulvitis, the injected region is thoroughly painted with a 1 per cent. mercurochrome 220 solution or a 10 per cent. silver nitrate solution, which causes relatively little pain. All the areas up to the hymen must be carefully painted and the sulci between the inner labia and the outer, the perineum, and the outer surface of the hymen must be given due attention. The child should, once or twice a day, be seated for fifteen minutes in a very warm sitz-bath, for the purpose of removing, as far as possible, the superficial desquamating epithelia. During the entire period, between treatments, and best applied immediately after the bath, a 2 per cent. protargol ointment, freshly made, is an ideal external medicament.

For irrigating the vagina I use a thick rubber tube with a lumen one-third of an inch in diameter. Into this I insert a urethral rubber catheter, leaving one or two inches extending beyond the end of the rubber tube. The catheter is then introduced into the vagina for the purpose of irrigation. The thick rubber tube, which covers the catheter is pressed closely against the hymen and the outer end of the vagina, prevents the ouflow of fluid, and thoroughly distends the vagina with the irrigating medium. On gradually releasing pressure by the outer tube, the fluid makes its exit without squirting into the face of the attendant. If, then, the speculum be introduced, and the

fluid be removed by thin swabs, a clear picture of the local lesions can be obtained, and the treatment to be mentioned can be applied.

So far as the vagina is concerned, these cases are treated by daily irrigations with iodine solution, using ½ dram of the tincture in 1 quart of water, or a 1 per cent. mercurochrome 220 solution, or by irrigation with warm saline solution, and the subsequent instillation with a curved eye-dropper of 2 drams of 0.05 per cent. colloidal silver. The treatment in the later stages consists of the injection of a 1 per cent. silver nitrate solution. A very good ambulatory treatment consists of the irrigation, every day, with saline solution, followed by the injection of protargol solution or by a protargol vaginal bath per speculum, and at later stages by the washing of the entire vaginal canal with 1 per cent. silver nitrate with the aid of the speculum, and repeating this three times a week. In the chronic cases the mucous membrane becomes tolerant of medicaments, and a stronger solution of silver than 1 per cent. must be used through the speculum. The hymen of the child is very thin and very elastic, quite as elastic as the foreskin of the male. The small speculum and curved eye-dropper enter the vagina easily, and will not tear any tissue or cause any bleeding.

The external genitalia may be washed with oxycyanide of mercury 1:5000. The vagina is then irrigated with 2 quarts of a weak solution of permanganate of potash, followed by the injection of several pipetfuls of a 10 to 40 per cent. solution of argyrol. This is done twice a day.

Treatment is continued until two weeks after the discharge ceases and no gonococci are found.

For the associated urethritis in children Sheffield uses the following urethral pencils introduced twice a day into the urethra:

℞. Protargol ..... gr. iij (to gr. xv)
Iodoform ..... gr. xv
Bals. Peru ..... gtt. vij
Ext. bellad ..... gr. j
Ol. cacao ..... q. s.
F. crayons (2 inches long, 1/16 inch thick) no. xv.

Urethral pencils may be made as follows:

℞. Ichthargan..... gr. 1/10
Ol. cacao..... ʒiss
F. urethral bacilli (2 inches long, 1/8 inch wide) no. xii.

For the treatment of rectal gonorrhea the rectum should be irrigated three times a day with any of the following solutions, after first cleansing with a normal saline enema: 1/5 to 1/2 per cent. protargol; 1 per cent. mercurochrome, 220; 1:1000 acriflavine; 1:5000 permanganate of potash.

With the aid of the small vaginal speculum the various silver salts may be directly applied to the rectum in stronger concentration. Old stubborn cases demand the use of the Paquelin cautery applied to fissures and ulcerations.

Improvement is evident: (1) by the character of the secretion, which gradually becomes paler and thinner, and less in amount; (2) by the gradual disappearance of the red inflamed character of the acute lesions and the restoration to normal color on the dermal covering of the vulva; (3) by the healing of the vaginitis and the cervical erosions. The cure of a vulvitis of specific character is not difficult. Generally we are dealing, however, with an invasion of the vagina and cervix, and absolute and complete rest in bed is essential to an early cure. A cure within six to twelve weeks may take place, with almost daily treatment. If the cervix is involved or if the vagina is deeply involved, recurrent virulent attacks may occur after symptomatic cure, though it is impossible to deny that in some cases a repetition of the original etiologic factor may have taken place. Ambulatory treatment is unsatisfactory. Added to the local treatment, gonococcus vaccine may be given, beginning with doses of 50,000,000 and increasing 25,000,000 until 400,000,000 is reached. The vaccine is to be given once a week, or else twice a week, with less rapid increase in the dose. In only a few cases is there an entire clearing up of the discharge, and some of these have a return sometimes within two years. So far the vaccine has not proved itself a specific by any means.

Constitutional Treatment.—However, in the words of Bumm: "All gonorrheas heal, if they do heal, finally through the natural reaction of the infected tissue. Without this help the complete

elimination of the gonococcus is impossible. Most unpromising, therefore, are the chronic cases (in the cervix and uterus) in which the tissue is accustomed to the gonococcus and in which the mucosa epithelium, through long irritation, has undergone metaplastic change to stratified squamous epithelium and only a slight secretion is found, consisting mainly of squamous epithelium. The cocci diminish or disappear under treatment, but on cessation of the latter reappear. Therefore constitutional treatment is often necessary."

The typical characteristics of virulent gonorrhea are: (1) an acute beginning; (2) a chronic course; (3) resistance to treatment; (4) virulence in new areas or new media for a very long time; (5) probable extension in continuity; (6) possible constitutional involvement.

The pathology of various lesions of acute gonorrhea shows the possibilities to be: (1) superficial involvement of the mucosa; (2) deep involvement extending into subepithelial connective tissues; (3) abscesses; (4) metastases; (5) constitutional involvement; and (6), which is very important, the early formation of adhesions. When these occur in the lower genital region, atresia or stenosis of the vagina or cervix may result.

GONORRHEA IN WOMEN

URETHRITIS

Acute Gonorrheal Urethritis.—In acute gonorrheal urethritis the lining of the urethra is diffusely red and swollen. The external meatus of the urethra is swollen and edematous. There is a purulent discharge. The urethra, when felt through the vagina, is thickened, infiltrated, and painful. There are a few exceptional conditions which simulate this involvement, such as septic ulcers, urethrocystitis after catheterization, puerperal fistulas, and degenerating malignant growths. The diagnosis of an acute gonorrheal urethritis can be readily made by an examination of the secretion, which contains pus cells and intra-cellular and extra-cellular gonococci. A purulent discharge from an inflamed urethra, especially if the external meatus is red and ectropic, is almost surely gonorrheal.

An acute urethral gonorrhea often causes very slight symptoms if limited to the anterior part of the urethra, and disappears much more quickly than in men. In three to four weeks the purulent secretion becomes milky and mucoid and contains many epithelia. Gonorrheal urethritis generally heals, and often without any treatment whatever.

Chronic Gonorrheal Urethritis.—In chronic urethritis there are red spots and streaks in the lining. There is redness about the follicles. The lining consists of stratified squamous epithelium plus leukocytes. The subepithelial tissue contains dilated vessels and an infiltration consisting mostly of mononuclear leukocytes. There is small-celled infiltration. This infiltration is especially marked near the external opening of the urethra, *i. e.*, in the papillary excrescences or caruncles.

In the chronic form there is a thick layer of squamous epithelium, but the subepithelial infiltrate is superficial. Gonococci are no longer present in the subepithelial tissue, but are present in the upper layers of the squamous epithelium or only in localized spots which look eroded.

Involvement of the Follicles of the Urethra.—There are many follicles in the urethra. The glands of the urethra are like those of the prostate. Infection of these glands is a severe complication, for it keeps up a chronic discharge of an infectious nature and may cause polyps. There may result a para-urethral abscess. In addition, there are the two glands of Skene, and the periurethral glands, which are four or more and situated in the wall of the urethra about its external opening. They often have a trumpet-shaped outlet. These should be examined before examining the urethra. Inflammation of the peri-urethral glands is acute or chronic. With recurrences, little abscesses may form. Inflammation of these periurethral constitutes the so-called urethritis externa—a very frequent condition.

Caruncles.—Proliferation from or about Skene's glands occurs with continued irritation and causes caruncles, which are polypoid, hyperemic growths in the anterior third of the urethra, originating from the inferior wall. They are covered with mucosa and protrude from the urethra. They consist of a loose, vascular, inflammatory infiltrate.

Chronic urethral gonorrhea may last for years. In chronic cases the speculum (Fig. 55) shows erosions, infected lacunæ, gray plaques surrounded by red areas, etc. The urethra feels hard and infiltrated and the secretion contains many degenerated epithelia. Infiltration in the chronic cases may be diffuse or circumscribed. In the diffuse form the wall of the urethra is extensively indurated. There are elevated folds of infiltration of a yellowish color. The healing areas are covered with epithelium and take on a grayish look. In the circumscribed form there are infiltrations about the lacunæ and Littré's glands. The epithelium is easily injured in these areas. The infiltrations heal and form fine sclerotic bands, which finally take on a white color and may form strictures.

Chronic gonorrheal urethritis may show spots of redness around the external meatus. Through the vagina the urethra feels thickened, infiltrated, and sensitive. A secretion is generally obtained readily on milking the urethra, but sometimes this secretion can only be secured if a period of from three to five hours elapses since the last urination.

Mild Gonorrheal Urethritis.—Chronic cases often escape detection, for a secretion can be obtained by massaging the urethra only in the morning before urination or if the patient has not urinated for several hours. Often the secretion is small in amount, yet symptoms may persist. A frequent form of mild gonorrhea consists of either a chronic or a subacute urethral infection, with or without an infection of the cervix uteri. There may be a subacute infection of the urethra without involvement of the cervix and vice versa. Gonorrhea is found more frequently in the cervix than in the urethra in older cases, whether chronic after an acute attack or subacute from the beginning. (1) A gonorrheal urethritis often heals as quickly or quicker than in men. The prognosis of even an acute gonorrhea is good if it is located in the urethra, either with or without treatment. (2) The largest number of gonorrheal infections are non-acute. Infection is transmitted to women from male urethras and prostates which are supposedly healthy or which give forth an unrecognized inflammatory secretion or which produce a discharge which is considered innocuous. In such cases pus does not come in contact with the urethra during the act of copulation. The infecting elements are expelled with the seminal fluid and thus come in contact with the cervix alone. When such secretions do infect the urethra, the character of the infection is very mild.

Symptoms.—The symptoms of urethritis depend for their severity on the acuteness of the involvement, but more particularly on the location. If the anterior part of the urethra is affected, the patients experience only a slight burning or an itching, due to irritation of the external meatus and the vestibule. Involvement of the posterior half of the urethra in the form of a urethrocystitis may give symptoms of such severity as to simulate a cystitis. Among the manifestations of the latter form are frequency of urination, painful and uncomfortable desire for urination; micturition may be so urgent and painful as to resemble tenesmus. In some cases there may be ischuria, that is, a difficulty in voiding urine or of emptying the bladder. The bladder may have to be catheterized. In such cases attempts at urination may cause a flow of blood.

In chronic cases there may be simply a frequency of urination, noticeable at night as well as during the day. In some instances the desire for urination at night is not so marked, but during the day, when the patient is in the erect position and the urine in the bladder touches the urethrocystic sphincter, frequency of urination is pronounced. In the milder chronic cases, especially in such as have a minimal amount of secretion, there is simply a tickling or burning on urination or a sensation of itching and a feeling of discomfort after voiding urine.

Diagnosis.—In acute cases the very existence of a purulent discharge from an inflamed, sensitive urethra, especially if the external meatus is red and ectropic, is almost proof of infection. Examination of the secretion by microscope shows gonococci. In the acute cases of urethritis, especially urethrocystitis, the amount of pus in the remaining urine, after the first few drams are passed voluntarily, is small. In a cystitis, however, all the urine is cloudy and contains pus cells, epithelia, and possibly blood, especially in the last few drams, whether passed voluntarily or withdrawn by the catheter.

In chronic cases a milky, thick, mucoid secretion can be obtained by massaging the urethra through the vagina. Pus cells and gonococci may be obtained by scraping the urethra with a platinum loop, but many such specimens, when examined, are found to contain only numerous squamous epithelia of all sizes and varying numbers of pus cells. Gonococci are apparently absent or few. Chronic gonorrheal urethritis may show spots of redness about the external meatus. Through the vagina the urethra feels thickened, infiltrated, and sensitive. A secretion is generally obtained readily on stripping the urethra. In very old cases or in cases subacute from the beginning, whether the amount of discharge obtained is large or minimal, the microscope shows mainly squamous epithelium, very few pus cells, and absolutely no gonococci. The fewer the pus cells, the greater is the probability of the absence of surface erosions and the greater is the probability of involvement of the glands.

In diagnosing chronic or subacute urethritis the urethra should be stripped through the vagina from the internal

toward the external meatus (Fig. 122). By massaging first the anterior half of the urethra and then the posterior, the discharge obtained by each of these manipulations will indicate whether the anterior half or the posterior half or the whole urethra is involved. To determine whether involvement of the urethral glands is the cause of the chronic discharge the patient should void, or else the bladder should be injected with a solution directly through the urethra without the aid of a catheter. The latter procedure (after gentle massage of the urethra has been done) clears the surface secretion away. If, after these procedures, the urethra is again massaged and more secretion is obtained, it comes in all probability from beneath the surface, that is, from the glands of the urethra. Such cases may show nothing but squamous epithelia under the microscope and gonococci are often not found.

The most satisfactory instrument for the diagnosis of urethral lesions is the Kelly endoscope. By this means the surface can be inspected, pathologic changes noted, and diseased areas treated.

In cases of chronic urethritis a sound introduced into the urethra shows the canal to be sensitive. Pain is caused by the sound, and irregularities may be felt which, too, are very sensitive.

Treatment.—In the treatment of acute gonorrheal urethritis attention must be paid to the diet, which should be mainly fluid. All spicy foods should be avoided. Alcohol in any form should be absolutely prohibited. Rest in bed hastens recovery to a considerable extent. Acute gonorrheal urethritis is best treated by internal medication only. All instrumentation is absolutely contraindicated in the presence of acute inflammation. Hexamethylenamine, in 7½-grain doses, with sodium benzoate, in 5-grain doses, may be prescribed every four hours. With this medication plenty of water should be taken, a glass of water being administered with each dose of these drugs. Helmitol, 15 grains, is sometimes better than urotropin.

Local treatment of the urethritis is to be begun only in the subacute stage. At this time balsam of copaiba, 15 grains in

capsules, or oleum santali may be administered three times a day. Of the internal antigonorrheic remedies, arrhovin is said to be free from the untoward effects of the balsams. Arrhovin internally is indicated in inflammation of the urethra associated with pain on urination and cystitis. In the chronic form it sometimes affords great relief.

Arrhovin is an aromatic fluid given internally in capsules. It causes acidity in alkaline urine, even in one undergoing ammoniacal decomposition. It is a sedative and anesthetic to mucosæ and does not upset the stomach. Six to twelve capsules, each containing 4 grains, are to be taken daily.

Twenty per cent. of kava kava and 80 per cent. of sandal-wood oil renders mucous membranes ischemic and anesthetic and lessens secretion, checks the growth of gonococci, is a diuretic, and prevents pain.

Of the drugs used for the local treatment of the urethra iodin, colloidal silver, nitrate of silver and protargol are the most valuable. In the earlier periods protargol, 1 per cent. or stronger, can be injected into the urethra with a pipet, or else several ounces are injected by syringe directly into the bladder per urethram with the Frank syringe, and then voided (Fig. 46). The patient should urinate and then the urethra should be massaged to clear the ducts and crypts of secretion before treatment is begun.

When small amounts of the stronger solutions are to be injected, the eye-dropper pipet is sufficient, the bladder being protected by a preliminary filling with any mild solution.

Topical applications to the urethra of 1 per cent. iodin crystals in mineral oil are extremely efficacious, as the oil is sufficiently tenacious to keep the medicament in prolonged contact with the mucous membrane, and the iodin is a powerful gonococcicide.

Before applying silver nitrate it is wise to have the bladder empty and massage the urethra. Then inject into the bladder several ounces of $\frac{1}{8}$ to $\frac{1}{4}$ per cent. solution of protargol. After removing the catheter inject into the urethra with a large straight glass pipet with large rubber bulb, several tubefuls of 1 per cent. silver nitrate, moving the pipet so that

half the quantity passes into the bladder while the other half will run out of the urethra. The protargol solution in the bladder should be voided at the end of three to five minutes. In the later stages, 5 per cent. nitrate of silver may be injected into the urethra every other day, the bladder being protected by a solution injected into it. This treatment of the urethra should be carried out three times a week.

Applications may be made to the urethral mucous membrane through a Kelly endoscope by aid of cotton wrapped about screw-tip metal applicators; or by the aid of cotton wrapped about the tip of a Braun syringe, the fluid being injected to moisten the cotton after introduction into the urethra (Figs. 67, 68). By gently withdrawing the tip of the syringe the cotton may be left in place for any desired time.

With the Frank syringe the urethra may be irrigated directly into the bladder without the aid of a catheter. Various solutions may be used, such as 1 per cent. ichthyol, 1 to 5 per cent. protargol, 5 per cent. argyrol, etc.

The same procedure may be carried out in milder cases or as a preliminary to local applications by using a solution composed of 1 dram of a combination of zinc sulphate, boric acid, and alum to the pint of water.

In chronic cases it may be necessary to introduce into the urethra sticks of cacao-butter containing protargol; or sticks containing iodoform or ichthyol. A method which is sometimes of value in the chronic form when the follicles are infected and when erosions are present is the injection into the urethra with a pipet of boroglycerin every other day. If this treatment is applied for six to twelve days, the subsequent application of silver sometimes cures a previously resisting case. In the still more stubborn cases due to stricture, to erosions, to involved follicles, 20 to 50 per cent. silver must be applied locally through the Kelly endoscope or small Ferguson speculum (Fig. 55), or else the actual cautery must be used.

It is sometimes necessary to dilate the urethra if it is infiltrated. Stricture of the urethra does not occur until the chronic stage, and it may be treated by gradual repeated dilatations, preferably with the Kelly female urethral dilator or

Hegar dilators. The urethra is then painted with 1 per cent. iodin or 5 to 20 per cent. cupric sulphate or 5 to 20 per cent. silver, with the aid of applicators. In continued involvement of the glands of Skene it is necessary to slit them up for their entire length and cauterize them (see page 86).

In the treatment of urethritis drugs are used in the following order: (1) Such as are purely antiseptic and not astringent; (2) antiseptic astringents; (3) astringents.

An ideal silver salt should (1) not coagulate albumin, (2) should not precipitate sodium chlorid, (3) be soluble in water, (4) cause no pain, (5) cause no irritation. These purposes are fulfilled by the newer oaganic silver preparations.

Among the antiseptic but not astringent silver salts used in urethritis are the following: protargol (8 per cent. silver), used in the strength of ¼ to 5 per cent.; largin (11 per cent. silver), ½ to 2 per cent., a stronger antiseptic than protargol; argonin (6 per cent. silver), used in ½ to 5 per cent. solution; albargin (15 per cent. silver), used in the strength of 1:1000 to 1:100; argyrol, 2 to 20 per cent. solution.

Among the antiseptic astringents which are ordinarily used to diminish hyperemia and hypersecretion in urethritis, which are germicidal but which cause slight irritation, are: nitrate of silver, 1:1000 to 1:100; argentamin, 1:1000 to 1:100; ichthargan (30 per cent. silver combined with ichthyol), 1:1000 to 1:500, is said to penetrate deeper than silver nitrate; ichthyol, 1:500 to 1:100.

Among the astringents which are used to diminish hyperemia and hypersecretion are: zinc sulphate, 1:500 to 1:100; acetate of lead, 1:100 to 1:50.

Urethral suppositories, called bougies, pencils, or bacilli, consist of a base of glycerin, gelatin, or cacao-butter.

The glycerin and the gelatin suppositories require a special machine for their manufacture, and are made containing various drugs by large drug firms. Any druggist can make the suppositories with the base of cacao-butter. Although glycerin is of value, the cacao-butter base suffices in most instances. A suppository for the urethra 2 inches long and ⅛ of an inch in

diameter contains about 8 grains of cacao-butter; one 2½ inches long and ¼ of an inch thick contains about 20 grains of cacao-butter. On this basis they may be made to contain various percentages of the various drugs. To obtain a suppository containing 1 per cent. of the desired medicament in a suppository 2 inches long and ⅛ of an inch in diameter:

℞. Iodoform..... gr. 1/12
Or—
Protargol..... gr. 1/12
Or—
Arg. nitr..... gr. 1/12
Or—
Zinci sulph..... gr. 1/12
Butyr. cacao..... gr. viij
F. tal. suppositoria urethral. (2½ inches long, ⅛ inch thick) no. x.

To order a suppository 2½ inches long and ¼ of an inch thick which contains 1 per cent. of the following drugs:

℞. Iodoform..... gr. ⅕
Or—
Protargol..... gr. ⅕
Or—
Arg. nitr..... gr. ⅕
Or—
Zinci sulph..... gr. ⅕
Butyr. cacao..... gr. xx
F. tal. suppositoria (2½ inches long, ¼ inch thick) no. x.

Increasing the percentage of the drug in any of these suppositories is rendered easy by simply making any desired multiple of the amount noted in the above forms.

If there is marked infiltration of the external opening of the urethra or of the entire urethra, gradual dilatation with metal sounds should be practised, followed immediately by irrigations or painting of the urethra.

Folliculitis about the external opening of the urethra is cured only by destruction of the follicles with the silver stick or with the cautery.

GONORRHEAL CYSTITIS

Frequent as is the occurrence of a gonorrheal urethritis in the female, extension of the inflammation to the bladder was referred, for a long time, to a complicating cystitis produced by

other bacteria or to involvement by the gonococci of the neck of the bladder alone. In recent years some instances of purely gonorrheal cystitis have been definitely diagnosed, so that its entity is positive. As a rule, however, the bladder mucosa is impervious to invasion by gonococci, unless previously damaged.

Histopathology.—In the early days Barlow was one of the first to find, in two cases of cystitis, only gonococci in the urine. The cystoscope showed diffuse inflammation of the entire bladder mucosa. Krogius, in two cases of purulent cystitis, found numerous gonococci in the epithelial cells in the urine. Wertheim, Bierhoff, and others have verified this condition many times. It is a fact, however, that gonorrheal cystitis is not so frequent, and most of the cases which have the subjective symptoms of gonorrheal involvement of the bladder are really cases of posterior urethritis or urethrocystitis, or represent an extension of inflammation rather than one of infection.

How deeply the bladder mucosa may be involved, however, is shown by a study of a case of purulent cystitis in a nine-year-old child, in which Wertheim found only gonococci. In narcosis a piece of the bladder mucosa was removed with the aid of the cystoscope. Gonococci were obtained in the cultures from the excised specimen. The microscopic examination of the specimen showed: (1) Gonococci between the epithelial cells; (2) gonococci extending in rows into the subepithelial connective tissue and lying almost entirely extracellular; (3) the surface of the mucosa covered with fibrin layers; (4) gonococci in the blood-vessels. The gonococci were not always of typical form, but were rather involution forms and groups looking like masses of granules.

Symptoms.—The symptoms are those of a very acute cystitis. The urine of a gonorrheal cystitis is purulent and contains pus, epithelia, and sometimes red blood-cells or blood. In the acute cases the last few drops obtained on emptying the bladder by catheter contain much pus, epithelia, and blood. The urine has no odor of ammoniacal degeneration. The standing urine forms a sediment of pus, and examination by the microscope shows gonococci. In the chronic cases pus is obtained by the

centrifuge and can be detected by the microscope. The first urine passed, which washes out the urethra, should be excluded. In some cases the urine is so slightly purulent that the cystoscope is essential to the making of a diagnosis of involvement of the bladder.

Treatment.—Acute gonorrheal cystitis should be treated by the liberal ingestion of fluids to dilute the urine. The use of salol theoretically results in the liberation of carbolic acid and salicylic acid in the urine. Hexamethylenamine is a very valuable urinary antiseptic as an adjunct to salol in doses of 7 grains every three hours. It is of great importance in the chronic form. Helmitol, 7 to 10 grains three times a day, gives off more formaldehyd in the urine than does urotropin. A valuable combination consists of sodium salicylate, 1 dram; hexamethylenamine, 1½ drams; tincture of hyoscyamus, 4 drams; elixir simplex, q. s. ad 4 ounces; 1 dram of this mixture being given in water several times a day. Benzoic acid, 10 grains three times a day in capsules, is a local alterative and antiseptic. It acts well in gonorrhea, and especially well in ammoniacal cystitis. Methyl-blue, 5 grains several times a day in capsules, is only mildly antiseptic.

℞. Hexamethylenamine
Sodii benzoat..... aa ℥iiss
Div. in dos. no. xx
S. One q. 4 h. with water

℞. Sodii salicylatis..... ℥iij
Div. in dos. no. xii.
S.—One powder t. i. d. with water.

℞. Ext. hyoscyam..... gr. ss
Salol..... gr. v
Hexamethylenamine..... gr. v
F. tal. caps. no. xx.
S.—One every three hours with water.

The pain associated with cystitis in the acute stage may be relieved by a suppository containing 1 grain of extract of opium, 1 grain of extract of hyoscyamus in oil of theobroma. The fluidextract of uva ursi, 1 dram three times a day, is a light stimulant and astringent and is of value in the early tages. The fluidextract of kava-kava, ℥ss three times a day,

is comforting, especially in gonorrheal cystitis. Balsam of copaiba, 15 grains in capsules, is a local stimulant to the mucous membrane. Among the other drugs taken internally are the alkalies, which should be given only if the urine is very acid. They are of special value in acid cystitis which is not gonorrheal and in cases of irritable bladder associated with acid urine.

℞. Ext. opii..... gr. j
Ext. hyoscyam ..... gr. j
Ol. theobrom., q. s.
F. tal. supposit. rectal. no. v.
S.—One when necessary.

℞. Infus. fol. uvæ ursi..... ℥xv
Syr. papaveris..... ℥iv
S.—One tablespoon every two hours.

The local treatment of acute cystitis is carried out by irrigation. A preliminary washing of the bladder is of value to remove pus and bacteria. Normal salt solution, 2 drams to the quart, or boracic solution, 4 per cent., is used for the preliminary washing, either of which fluids have a non-irritating influence on the mucous membrane.

The preliminary irrigation should be followed by irrigation with fluids which have a destructive action on the bacteria and which exert a stimulative influence on the epithelium and so aid in the throwing off of bacteria. Protargol, while not quite so valuable in this respect as silver nitrate, is much less irritating and should be used in the acute stages. Protargol works well even in weak solutions of 1:800 up to 1:500 in the acute stages, and from 1 to 5 per cent. in the more stubborn cases. Several ounces are to be injected into the bladder and allowed to remain for five to ten minutes. A weak watery solution of iodin, and 1 per cent. mercurochrome-220, are also extremely useful. If the bladder is unusually sensitive, it should be first anesthetized by injecting an ounce of a 1 per cent. solution of eucain or of a 2 per cent. solution of alypin. In place of protargol, the bladder may be irrigated by ¼ to ½ per cent. watery solution of ichthyol, which should be left in place for several minutes (Fig. 47). All solutions should be used warm.

In the subacute stage or in stubborn cases nitrate of silver diminishes congestion and stimulates regeneration, and is, in addition, a very valuable germicide. When used in solution of 1 : 10,000 and gradually increased to 1 : 5000, and in very stubborn cases even to 1 : 1000, it renders the urine clear. If too irritating, it should be preceded by the use of an anesthetizing solution. The strength of any of the irrigations depends upon the sensitiveness of the bladder, which can be judged by the preliminary washing with saline or boracic solution and by the amount which the bladder can hold when this preliminary solution is injected.

Permanganate of potash is an antiseptic of value and may be used in the strength of 1 : 10,000 to 1 : 2000 particularly in the presence of ulcerations.

Finger's method is as follows: In the acute cases of urethrocystitis and cystitis he advises a symptomatic and expectant treatment. Regulation of a hygienic, deitetic character is often enough to cause a rapid cure of the condition. Of prime importance is rest in bed. As fluids he prescribes thick decoctions; among them is: Decoctio fol. uvæ ursi, 500; syr. papaveris, 15; one tablespoonful every two hours.

If there is hematuria, he administers styptics, among which he includes solutio ferri sesquichlorati.

℞. Liq. ferri sesquichl..... gtt. xv
Syrup. aurant. cort..... ℥vj
Aq. destillat..... ℥vj
S.—One tablespoon every hour.

In stubborn cases of hematuria he injects 2 to 3 c.c. of a 1 : 1000 adrenalin solution into the bladder with very good results. A 0.5 per cent. solution of alum, however, is more economical, just as efficient, and the benefits derived therefrom are more permanent.

Pain is treated by extract of belladonna and morphin in suppositories or by subcutaneous injections of morphin. He also advises warm moist applications to the abdomen.

When the irritating symptoms have disappeared and the objective symptoms still remain, Finger makes use of internal

treatment and of irrigation. Internally he uses oleum santali, gonosan, balsam of copaiba, which rapidly clear the urine.

℞. Acidi benzoici..... ʒj
Syrup. cort. aurant..... ʒv
Aq. destillat..... ʒviij
S.—One tablespoon every two hours.
℞. Ol. santali..... gtt. x
Disp. tal. dos. no. xx.
S.—One capsule t. i. d.
℞. Ext. cannab. ind..... gr. iij
Ext. hyoscyam..... gr. v
Sacch. lactis..... ʒiss
M. f. pulv. Div. in dos. xij.
S.—Three to five powders daily.

Care is necessary in the use of alkaline waters.

If the urine is only slightly acid, or alkaline, and if there is a tendency to phosphaturia, these waters are contraindicated, since they increase the alkalinity of the urine, and increase the phosphaturia. An effort should be made to keep the urine acid, to make it acid if alkaline, for which purpose the balsams, sodium salicylate, benzoic acid, and especially acid sodium phosphate are best.

If the urine still remains cloudy and if it contains mucus and pus, local therapy is indicated. The bladder is irrigated by injecting 80 to 100 c.c. of boracic acid and letting the fluid run out through the rubber catheter. This is repeated two or three times. Then one of the previously mentioned solutions may be injected into the bladder and left in place for three to five minutes or longer.

Benzyl benzoate, 20 per cent., given in milk in 20 minim doses, every four hours, is an efficient antispasmodic for the relief of tenesmus. It may be reinforced by intravesical instillations of 1 ounce of 20 per cent. oil of cajeput in sterile olive oil.

In chronic cystitis, in addition to local and internal treatment, a cure is often obtained only through a general tonic régime.

GONORRHEAL VULVITIS

Diffuse structural involvement of the vulva of adults by the gonococcus is rare, although it is often irritated by the

gonorrheal discharge coming from the higher areas of the genital tract or from the urethra. The vulva is red and eroded in spots. The small labia and clitoris may be edematous. The vestibule and labia are also swollen, red, eroded, and covered with pus and crusts. The ring of the hymen is swollen and red and pus is collected in all the recesses and in the fossa navicularis. The openings of the ducts of Bartholin are red.

Acute gonorrheal vulvitis in adults is comparatively rare. The symptoms are burning, itching, and pain. The contact of urine increases the annoyance. There is much secretion. There is heat and burning in the vulva. Walking causes discomfort, because of the resulting friction of affected parts. The inguinal glands are swollen and sensitive. The parts are sensitive to touch and examination. This condition improves rapidly, and in ten days to two weeks the eroded areas are cleared up and evidences of inflammation are almost gone. Acute vulvitis is of various degrees of virulence and the above annoyances may be relatively slight.

There are numerous small glands in the vulva situated about the urethra, in front of the hymen, and in the fossa navicularis, which, when infected, may form small purulent nodules which may later develop into small abscesses. They may have the appearance of small furuncles, really forming a gonorrheal furunculosis. In the acute cases we see red spots from which a purulent or mucoid secretion may be pressed out.

In a chronic vulvitis the glands in the vestibule, the glands of Bartholin, and the glands about the external opening of the urethra are involved and secrete pus or muco-pus. The fourchet is eroded. Gonorrheal vulvitis in adults is secondary to gonorrhea of the cervix and uterus. Vulvitis without purulent urethritis and without purulent cervical or uterine discharge is probably not gonorrheal. This is easily determined by microscopical examination of the secretion. In chronic vulvitis we must exclude vulvitis due to masturbation, vulvitis due to uncleanliness and to other bacteria, as well as vulvar changes due to syphilis, etc.

Treatment of Chronic Vulvitis.—Acute gonorrheal vulvitis should be treated by cleansing of the external structures. Mild

solutions of oxycyanide of mercury, 1 : 5000 to 1 : 10,000, should be used. The parts should be carefully separated and gently sponged with cotton soaked in this solution. Generous dusting of the parts with stearate of zinc prevents friction. Sterile gauze should then be placed in such a manner that the two sides of the vulva are kept apart and a moderately tight T binder applied. The vulva should be washed in this manner several times daily, each washing being preceded by a vaginal douche of iodine. Laxatives should be administered and the kidneys kept active. In the subacute stage the vulva is to be treated by the silver salts. It should be painted with argyrol 25 per cent., or with nitrate of silver 10 per cent., and the surfaces should be kept dry by gauze dusted with aristol or stearate of zinc.

The cure of chronic vulvitis is sometimes difficult. Infiltrated, swollen, and suppurating follicles can be painted with silver solution, 10 to 20 per cent. but the best treatment is to destroy the follicles or plaques with the actual cautery.

BARTHOLINITIS

Infection of either of the two vulvovaginal glands of Bartholin by the gonococci may occur as early as fourteen days after the primary infection, but it generally occurs weeks or months or even years afterward. It is especially frequent among prostitutes. The orifice of the duct of the gland is red and swollen. The gland itself may be scarcely felt. Pressure on the posterior part of the large labium forces pus out of the gland. The patient is sensitive to pressure and there is some pain on walking or sitting. Closure of the duct causes a spindle-shaped or round swelling the size of a hazelnut. If the retained purulent secretion is large in amount, there follows a pseudo-abscess the size of a pigeon's egg or larger.

Abscess of the Gland.—In the acute form there is an acute swelling of the whole gland. Secretion finds no outlet through the swollen duct and purulent contents are accumulated. The surrounding tissue becomes infiltrated and there is seen in the lower third of the large labium a swelling the size of a small egg, which projects toward the introitus and pushes the other

labium to the other side. Its surface is red and swollen. The whole area is markedly sensitive; there is pain and a sensation of burning and irritation. If the surface at any part becomes thinned out, the abscess may break spontaneously on the outer surface of the labium, or occasionally into the rectum.

While acute non-gonorrheal infection of the Bartholinian glands is uncommon, a Bartholin abscess is sometimes due to

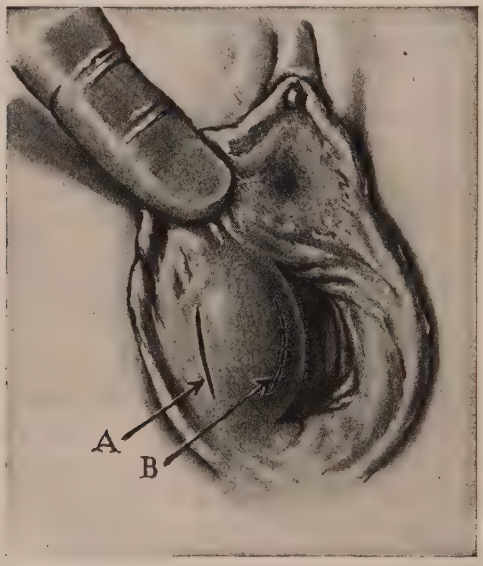


Fig. 131.—Incision of Bartholin abscess: the incision should be placed well out on the skin surface, and not on the vaginal side of the abscess. *A* indicates proper site; *B*, is over the usual point of greatest softening, but is likely to result in severing of the duct.

other pyogenic micro-organisms. Not infrequently the tubercle bacillus or colon bacillus will be found. It is therefore a grave error to tell a patient that she has gonorrhea, simply because she presents herself with a Bartholin abscess, until the diagnosis has been confirmed by microscopic examination of the secretion. The purulent gonorrheal form is considered to be a mixed infection and results as follows: The duct is inflamed and in it there is a subepithelial infiltrate. The lumen is filled with

cell detritus, with squamous epithelia, and gonococci. The duct is easily obstructed, pus accumulates, and a pseudo-abscess results. If a mixed infection takes place when the gland becomes affected, there are found, in addition to gonococci, staphylococci and streptococci. If the pus is fetid, it is due to anaërobic bacteria.

In chronic cases the outlet of the duct is red, flea-bite in appearance, forming the so-called maculæ gonorrhœicæ. There is a secretion of mucopurulent or mucoid character.

Chronic Bartholinitis.—A chronic Bartholinitis often represents the only spot on the external genitalia which is affected in chronic gonorrhea. If there is an accumulation of secretion, a nodule is present. If not, there are only red flea-bite spots about the openings of the ducts.

Subacute Bartholinitis.—In subacute involvement there is only slight redness and swelling and no pus accumulates in the gland. The inflammation is catarrhal in character. Here also the opening of the duct is red, forming the so-called maculæ gonorrhœicæ. If the outlet through the duct is obstructed, a cyst may be formed. In chronic cases the gradual accumulation of secretion (in which cocci are absent) and without inflammatory symptoms may form a cyst of the gland.

Cyst of the Gland of Bartholin.—Cyst of the gland of Bartholin is not necessarily gonorrheal, according to general opinion. However, the view of Veit and others is that a gonorrheal infection, perhaps dating back to the years of childhood, has produced a cyst in the clear secretion of which inflammatory evidences are entirely gone.

Treatment.—In the early stages of a Bartholinitis physical rest and cold applications are indicated. As soon as an abscess forms it must either be incised and drained, or better still, completely extirpated by dissection. If an incision is made, it should be placed well out on the skin surface, rather than through the labial mucosa, because the swelling may carry the duct upward, thus exposing it to division by the knife (Fig. 131). Severing of the duct is likely to be followed by recurrence or a fistula. After evacuation of the pus, the cavity should be packed with iodoform gauze.

Complete excision of the abscess should never be attempted under local anesthesia. Venous bleeding may be free, and it may be necessary to tie many vessels to secure complete hemostasis. This cavity too, should be packed, but the bleeding must be controlled first. A small drain is brought out through a stab wound below the incision.

In chronic Bartholinitis the glands can be treated by irrigations and injections if the duct is large enough. In this way the involved gland or cyst may be brought by an active reaction to obliteration. The best treatment, however, is to remove the gland or cyst surgically.

GONORRHEA OF THE ANUS AND RECTUM

Baer found that in one hundred and ninety-one cases of gonorrhea there was rectal involvement in 30 per cent. There is a sensation of heat and burning in the anus which is increased on defecation. Erosions, ulcers, and especially fissures of the anus are present and sometimes blood is passed. A secretion is generally obtained after manipulation or on the use of the rectal speculum, and shows gonococci. On examination with a speculum the rectal mucosa looks red and edematous and may show ulcerations, as a result of which infiltrations take place. This condition is frequently overlooked. Many women suffering from fissures of the anus and from inflamed "hemorrhoids" are really suffering from gonorrheal involvement of the anus and rectum. I have found this to be the case in many instances where no other symptoms were complained of. Further examination shows an undiscovered cervico-uterine gonorrhea.

Treatment.—For the treatment of rectal gonorrhea the rectum should be irrigated three times a day with any of the following solutions, after first cleansing with a normal saline enema: 1 to 5 per cent. protargol; 1:5000 oxycyanid of mercury; 1:1000 acriflavine; 1:5000 potash permanganate.

With the aid of a rectal speculum the various silver salts may be directly applied in stronger concentration. Old stubborn cases demand the use of the Paquelin cautery applied to fissures and ulcerations.

GONORRHEAL VAGINITIS

In chronic gonorrhea in the female the vagina may seem normal, but in acute cases, especially in young women, there may be an involvement of the vagina which is secondary and is due to the continued discharge of gonococcus-bearing secretion from the cervix and uterus. The vagina is then red and swollen and there is a purulent secretion.

Histopathology.—In children the cocci readily enter the vaginal epithelium. When the gonococci enter the vaginal mucosa the changes are: (1) The surface epithelium is gone; (2) all the epithelium is destroyed in spots; (3) gonococci enter the epithelium in certain areas in bands; (4) the gonococci may reach the connective tissue in spots and may extend beyond the epithelial limit. Though the gonococci are generally in the superficial connective tissue, yet in certain areas they may become more deeply embedded.

Ghon and Schlagenhaufer have found that the subepithelial connective tissue shows small-celled infiltration. Papillæ with dilated vessels project above the surface and the epithelium of these papillæ is only of one or two layers. There are many polynuclear leukocytes in the infiltrate. In the posterior fornix the epithelium is loosened and infiltrated with polynuclear leukocytes. Papillæ infiltrated and rich in vessels project like small polyps and their epithelial covering is of one layer or is gone. The change is most pronounced in the region of the external os. Here the epithelium is absent and numerous papillæ project above the surface. Mononuclear and polynuclear leukocytes cover the surface.

Symptoms.—When the vaginal wall is invaded by gonorrhea, it is very red and bleeds easily. There are many eroded areas covered by a membrane composed of fibrin, pus cells, epithelium, and gonococci. This is particularly evident in the posterior fornix. The vagina is very sensitive on examination, there is a sensation of heat and burning in the vulva, and the patient can scarcely walk. Pressure on the abdomen causes pain, and coughing, or even talking may be painful. There is elevation of temperature. There is a feeling of weight and burning in the genitalia. There is purulent discharge. Pain

extends into the pelvis and is increased by defecation and activity. Vulvitis and intertrigo and eczema are added. The introitus vaginæ is swollen and red and eroded spots are noted. Sometimes the vagina is so sensitive that even most careful examination causes vaginismus.

After the acute stage is over, in some cases the vaginal folds are infiltrated and covered with small red granules, the so-called vaginitis granularis. The acute stage lasts eight to ten days. Gonorrheal vaginitis is generally healed in three or four weeks. Recrudescences occur, especially after menstruation.

Bumm says it heals in three to four weeks. The pus cells become fewer, more epithelia appear, and the discharge becomes white and granular. Light recrudescences may occur at menstruation. Bumm denies the existence of chronic vaginal gonorrhea. He says that vaginitis granulosa, which is generally considered a form of chronic gonorrhea, is not due to this etiology. He says that cocci cannot be found in most of these cases and that when the secretion is inoculated on sensitive mucous membranes, negative results are obtained.

Gonococci are hard to find in the vaginal secretion because of the myriads the other cocci present. Irrigation of the vagina with silver solution causes cell desquamation. If then the vagina is scraped with a spatula or curet, we may find gonococci.

Secondary Gonorrheal Vaginitis.—Gonorrheal vaginitis is usually secondary and due to the irritation produced by cocci from the cervix and uterus. Rarely do the cocci invade the wall and multiply. Gonococci, however, may develop in the vagina, in the squamous epithelium, but as a rule they do not go deep. It has been shown that individual characteristics and not alone the squamous character of the epithelium play an important rôle. The vaginal epithelium in younger women, in gravidæ, in women with tender skin, lends itself more readily to gonorrheal vaginitis because of the succulence of the mucosa and the thinness of the epithelial layer.

Primary Gonorrheal Vaginitis.—Primary gonorrheal vaginitis does occur; it has been noted even after total hysterectomy. The vagina is hot, shiny, red, swollen, and bleeds easily. It is covered with pus or fibrin, under which are red, eroded areas.

In chronic vaginitis the mucosa is thickened, the folds are prominent and covered with granulation spots. There is erosion of the cervix or else eroded or swollen mucosa is found in the posterior fornix. Sometimes as the end-result of a vaginitis chronica we get a condition resembling psoriasis, characterized by a thick, hard, dry, white mucosa.

Treatment.—In acute localized vaginitis the patient should have rest in bed, the external genitalia should be thoroughly cleansed, and cool or tepid sitz-baths may be taken daily. Alternate douches of oxycyanid of mercury, 1:5000, and acetate of aluminum, 1 dram to 2 quarts of water, should be given four times daily and gauze soaked in 1:5000 oxycyanide of mercury or in 1 per cent. acetate of aluminum should be applied to the perineum and vulva. Internally bromids and opium may be administered. When the primary inflammation and sensitiveness are diminished, douches of one dram of tincture of iodin in 2 quarts of water or ½ per cent. carbolic acid are of value. If the vagina is not too sensitive, it should be washed, with the aid of a Ferguson speculum, with sponges soaked in a carbolic solution, and gauze soaked in 1 to 5 per cent. protargol should be introduced into the vagina and left in place for several hours. Still later the vagina can be bathed, with the aid of a Ferguson speculum, by solutions of 1 per cent. mercurochrome 220, or nitrate of silver 1 to 5 per cent., and the vagina should be gently packed with sterile gauze or iodoform gauze left in place for twenty-four hours. Then irrigate daily with alum 2 per cent. or permanganate of potash 1:1000. In the chronic persisting forms of vaginitis the Ferguson speculum should be used and nitrate of silver thoroughly applied in very strong solutions (Figs. 52, 54).

In very chronic cases if silver 1 per cent. or stronger fails, paint the vagina every two to three days with tincture of iodin or silver 5 to 10 per cent. and pack the vagina with iodoform gauze for twenty-four hours. Continue the treatment till the vaginal epithelium desquamates. Douches should then consist of tannic acid, sulphate of zinc, or alum, 1 dram to the quart. Splendid results follow bathing the vagina, with the aid of the Ferguson speculum, with corrosive sublimate 1:100

rendered acid by adding a few drops of hydrochloric acid. Then pack with iodoform gauze for twenty-four hours and repeat twice a week. In the mean time irrigate with 1:5000 oxycyanide of mercury. In that chronic form known as colpitis granulosa, first clean the vagina with the aid of the Ferguson speculum, and then use pyroligneous acid in the speculum, rubbing it well into the vaginal mucosa with cotton sponges. This should be done two or three times a week. Between treatments astringent douches are taken.

The following represents Finger's treatment of gonorrheal vaginitis:

Acute vaginitis is often overcome by the use of cleansing douches, but the subacute and chronic forms are often stubborn.

In the early acute stages make use of rest in bed, take care of the bowels, prescribe cool sitz-baths, and cold applications to the genitalia and the perineum. Diet should be mild and non-irritating. Bromids, chloral hydrate, and morphin control the nervous symptoms.

So soon as instruments can be introduced into the vagina the vaginal mucosa should be cleansed by tampons with the aid of the Ferguson speculum. The vaginal wall is then washed or bathed with largin or protargol 3 to 5 per cent. or 1 to 2 per cent. permanganate of potash.

When the subacute stage is reached, and especially in treating vaginitis granulosa, there is used, in addition to the permanganate of potash, every second or third day, 1 per cent. silver solution for bathing the vagina. After each vaginal bath a tampon or gauze soaked in 5 per cent. largin glycerin solution should be introduced into the vagina.

This method of treatment should be carried out twice a day. If the treatment, however, must be carried out by the patient, douches must be used consisting of 2 to 5 per cent. largin, 1 per cent. permanganate of potash, 1 per cent. sulphate of zinc, 2 per cent. alum, 5 per cent. ichthyol, or 2 per cent. argyrol. Such douches must be taken three times a day and consist of two quarts. In such patients as must treat themselves with douches, every third day a vaginal bath should be given with 1 per cent. silver or a watery solution of iodin.

In the treatment of stubborn subacute vaginitis the vagina must be bathed daily with the above-mentioned drugs and the vagina tamponed. This treatment is continued for several successive days until the mucosa begins to be cast off. Then bathing is stopped and the above-mentioned irrigations are used daily until regeneration of the mucosa takes place. If then a normal mucosa does not result, the same treatment must be attempted over again.

Sänger makes use of corrosive sublimate. In order to aid the action of the corrosive sublimate, he introduces into the vagina a tampon soaked in tannic glycerin. The next day the vagina is cleansed with soap and water, and then with the aid of a Ferguson speculum is thoroughly bathed with corrosive sublimate 1:500 to 1:1000. Then a tampon soaked in iodoform-glycerin is introduced. In stubborn cases the vagina is also painted with tincture of iodin.

In the treatment of cervicitis Finger, when the acute stage is over, paints, with the aid of a Playfair sound, with 5 to 10 per cent. solution of protargol, and later with strong silver nitrate or tincture of iodin. Erosions of the vaginal portion heal rapidly with this treatment and healing is aided by occasional painting with 5 per cent. acidum trichloraceticum.

CERVICO-UTERINE GONORRHEA

In acute infections of the cervix the gonococci pass between the epithelial cells down to the connective tissue of the mucosa. There is a great infiltration with leukocytes, which wander up to the surface through the epithelium. In isolated areas the epithelium is gone or replaced by a layer of flat or round cells. In other areas there is a beginning formation of squamous cells. Nowhere does the process seem to extend markedly into the gland lumina.

In acute cervical gonorrhea the portio, when seen through the speculum, looks swollen, and its covering appears shiny and red. The cervical mucosa projects as two dark-red, lip-like protrusions. There is a discharge of greenish-yellow pus. The posterior fornix of the vagina is often red. Follicles of the portio may be purulent. Marked subjective symptoms are

generally absent. Patients complain only of the discharge and of burning in the vulva. There is some feeling of weight in the pelvis and dull pains in the back. Gonococci are found by microscope. Due care must be exercised not to mistake the micrococcus catarrhalis for the gonococcus.

In acute gonorrhea there is eversion and protrusion of the mucosa, which bleeds easily. There may be erosions or ectropion. Later the secretion is milky, mucoid in character, or only cloudy mucoid. Even in a clear mucoid discharge gonococci may be found.

Acute gonorrheal endometritis represents an acute interstitial inflammation with small-celled infiltration. In acute gonorrhea of the uterus the cervix looks swollen, shiny, and red. If uterine involvement occurs after the cervix infection has improved, the latter often lights up again. Pressure in the fornix, on the portio, and bimanual examination cause pain. The symptoms are fulness in the pelvis, discharge, sensitiveness to jars, pain in the pelvis and back, constant discomfort in any position, a sensation of pulsation, and often temperature. The sooner after the cervix infection the uterine infection occurs, the worse are the symptoms. They are less if the infection extends gradually into the uterus or if it passes into the uterus after the cocci have become less virulent and then become active after labor, or abortion, or curetting. Attacks limited to the uterine mucosa may subside quickly and the acute symptoms disappear.

Acute metritis arises from acute infection and is an active process. There are chills, fever, dull pain in the pelvis. The patient seeks her bed. Often the tubes, ovaries, and peritoneum are simultaneously affected, with or without the production of exudates. Chronic metritis may result from such an acute metritis or may be subacute from the beginning. This is especially so in young married women infected from a supposedly cured gonorrhea by cocci of diminished activity. There is then a gradual onset of pain in the back and pelvis, especially at menstruation. There is cervical erosion or ectropion of the cervical mucosa. Exacerbations occur with abortion and labor. Acute metritis demands rest in bed for weeks.

Point of Location in Acute Gonorrhea.—In acute cases of gonorrhea, according to Bumm, the urethra is affected in 90 per cent.; the cervix in 40 per cent.; the glands of Bartholin in 12 per cent. In one hundred patients of Bumm's, however, in whom the cervico-uterine infection was at least five months old, only six had just a chronic urethritis with gonococci; thirty-seven had gonococci in the cervix and urethra; fifty-seven had gonococci in the cervix alone. Of the ninety-four cases whose cervico-uterine secretion contained gonococci, fifty-one had symptoms which indicated an infection of the uterine mucosa and forty-three had a more or less distinct pelvic peritonitis with disease of the adnexa. The proportion in these hundred cases is not a criterion in general, for many patients with a fresh but non-virulent infection of the urethra or cervix do not consult a physician. Of seventy-four other cases observed by Bumm from the very beginning, for periods of five months to a year or more, 97 per cent. had urethritis, 70 per cent. had an affection of the cervix, 23 per cent. an involvement of the corpus of the uterus, and 10 per cent. tubal disease. It must be remembered, however, that tubal involvement often comes on months or years later and is of milder form.

Chronic Gonorrhea.—Bumm says that in chronic cervical gonorrhea the glands of the cervix are not affected. He examined five uteri, the seat of chronic gonorrhea, which were removed by hysterectomy for salpingitis. He found that in chronic cervical gonorrhea the glands are intact and that the epithelium is almost normal. Cocci are present only where the epithelium is gone, and at these points there is a great round-celled infiltration under the epithelium. The cocci do not extend into the connective tissue. Round-celled infiltration is observed wherever cocci are present, and superficially at these points there is a coating consisting of pus cells and coagulum. Gonococci are found in the metaplastic epithelium, but the epithelium, of the glands is immune just as Bumm claims is the case with the glands of Bartholin. Chronic cervical gonorrhea represents, therefore, an invasion limited to certain small areas. Gonococci are found in the metaplastic epithelium and thence mix with the secretion. The regenerated cylindric

epithelia seem to be immune to the cocci. Therefore no deep action would seem to be necessary to destroy these invaders.

Chronic Gonorrhea of the Uterus.—Of eighteen uteri removed by Wertheim for gonorrheal disease of the adnexa, in eight gonococci were still present in the secretion of the uterus. He found gonococci in groups on the epithelium, in the interepithelial spaces, and likewise in the subepithelial tissue. He observed a change to squamous epithelium and a huge infiltration with round cells and leukocytes. Macroscopically such uteri are enlarged, the wall is thickened and hard, and the mucosa is thickened to 5 mm. There is edema of the interstitial tissue. The mucosa is hypertrophied. In one-half of the cases there is also glandular endometritis. (Döderlein relies upon this observation as an argument against judging of the etiology of endometrial changes from findings by the microscope.) At any rate, the interstitial changes are present.

In chronic gonorrhea of the mucosa, according to Bumm, the invasion is restricted to the upper layers. The increase of leukocytes and the rich cell infiltration of the interglandular connective tissue represent to him a "distant action of the cocci." Bumm says that the invasion of the muscular layers by round-celled infiltration is not caused, as Wertheim contends, by the entrance of cocci into the muscle bundles. In a uterus with chronic endometritis and pyosalpinx he believes there is enough chronic irritation and hyperemia to produce such round-celled groups. (He evidently insists on his theory of superficial action.)

Gonococci were also found in the uterine wall in the above cases of Wertheim, just as bacteria are observed there in puerperal endometritis. In many cases there was infiltration of the muscular tissue, growth of the vessel walls, and hyperplasia of the connective tissue. Wertheim believes the gonococci to be present in the inflammatory infiltrations in the muscle tissues.

Symptoms of Chronic Gonorrhea.—Chronic gonorrhea of the uterus, if superficial and limited to the uterus, causes few symptoms. In fact, there may be only a slight secretion, discoverable only by the use of a Schultze tampon (Fig. 11).

Therefore there are many cases of unrecognized gonorrhea of the tubes whose only symptom is sterility. If the involvement is deep, there is really chronic metritis. The uterus is large, hard, and the mucosa is hypertrophied. There may be profuse discharge. In my opinion bleeding, when a symptom, is due to the end-changes in the uterine wall and not to early changes in the mucosa. Conservative treatment may cause great improvement, and then overexertion, abortion, curetting, etc., may cause a return of the fluor, with other symptoms.

Wertheim took five patients with fresh gonorrhea in whom the adnexa were normal and in whom there were no subjective symptoms of an affection of the endometrium. He curretted particles from the corpus mucosa and examination of the sections disclosed gonococci in them all. Neither the internal os nor the isthmus of the uterine part of the tube stops the progress of the gonococci in an apparently localized cervical gonorrhea.

Diagnosis.—When gonorrhea of the cervix and uterus becomes chronic the discharge becomes less, and then mucoid or mucopurulent and mixed with many squamous epithelia which may contain cocci. When this occurs, the prognosis is uncertain, for the cocci may disappear for weeks and then reappear. Chronic gonorrhea is very hard to diagnose because of the absence of characteristic symptoms, especially if limited to the cervix. Often the only symptom is discharge, which is mucoid, sometimes yellow or green, yet, according to Bumm, it may even be clear when gonococci are present.

Döderlein's observation that gonorrheal endocervicitis and endometritis are often hard to determine is justified. A bright red external os is of as great significance as erosions, which are often present. On the other hand, erosions may be absent. There is frequently just a slight eversion of the mucous membrane at the external os. The discharge, if clear, may change after menstruation and become yellow for a short time. This same change may occur with congestions or after the use of silver. Chronic localized cervical gonorrhea causes so few symptoms that it is generally an accidental discovery. The presence of salpingitis in nulliparæ, if appendicitis, tuberculosis, and sepsis be excluded, is of great importance. The time at

which the symptoms first appeared is of the utmost importance, for these evidence themselves not infrequently within a short period after marriage or soon after a new infection in the male.

Acute vulvovaginitis and urethritis are associated with profuse purulent secretion, intertrigo, and sometimes with Bartholinitis. The vulva is red. If the infection extends upward, we get metritis with fever, pain in the pelvis and back. There is enlargement of the uterus, a sensitive uterus, and pus, or pus and blood, from the uterus. In virulent cases there are exudates in the pelvis, in the tubes, in the ovaries, occurring through parametritis and perimetritis and perisalpingitis and peritonitis.

Latent gonorrhea produces the following picture: After marriage there is noted increased leukorrhea, especially near menstruation. There is burning and pruritus in the vulva. There is dull pain in the pelvis and back, which is increased by exertion. Colicky pains occur before menstruation. Pregnancy often ends in abortion, and perimetritis and perioöphoritis occur. Then the symptoms grow worse and are increased by dancing, exertion, coitus. Acquired dysmenorrhea occurs before or during menstruation. There may be irregular menstruation. The patient becomes thin, looks badly, is nervous and hysterical. Examination shows increased secretion from the genitalia. The outlet of the Bartholin ducts is red. There is a glassy or milky secretion from Bartholin's glands, increased by pressure. There is redness about Skene's glands and the small labia.

Condylomata may be found on the posterior commissure or about the anus. The vagina perhaps is a little red. The portio is thickened, the cervical mucosa is red, and ectropion or erosions are observed. The increased secretion from the cervix is sometimes not pathologic in appearance, but oftentimes purulent or mucopurulent. The uterus is lengthened and sensitive. Perimetritis and parametritis are often present. The ovaries are enlarged and sensitive. Such conditions result from continued infection in the female by non-active gonorrhea.

Gonorrhea with No Clinical Symptoms.—Gonorrhea in the female with no clinical symptoms is frequent. Neisser has

called attention to the fact that puellæ publicæ may show none of the clinical symptoms, no redness, no swelling, no purulent secretion from the vagina, uterus, or urethra, and yet may harbor gonococci which produce infection per coitum.

According to Finger, Laser examined the cervical secretion in sixty-seven puellæ publicæ and found gonococci in twenty-one. Of these twenty-one, only four had clinical symptoms of cervical catarrh; the other seventeen, from the clinical standpoint, could be considered normal. Three hundred and fifty-three examinations of urethras showed one hundred and twelve to contain gonococci. Of these, in ninety-one there was no secretion from the urethra; in sixty-one there were no clinical symptoms of urethritis. In 10 per cent. of puellæ publicæ with only mucoid uterine secretion Welewski found gonococci.

This shows the necessity for bacteriologic examination particularly after the acute stage is over. In some cases gonococci are easily found for months and years. This occurs in patients who have infection of acute nature and indicates an especial sensitiveness and susceptibility on the part of such patients.

Schiller and Bröse in two hundred and thirty-five cases of chronic gonorrhea found, according to symptoms, that the urethra was affected in one hundred and eighty-one, the cervix in two hundred and sixteen, and the adnexa in one hundred and thirty-nine; yet they found gonococci in only 45 per cent. in the urethra and in 32 per cent. in the cervix.

In the acute cases the microscope shows gonococci in the protoplasm of the pus cells and in groups on the epithelial flakes. In chronic cases repeated examinations are necessary to find the gonococcus. In very many cases they cannot be found at all. Pus or mucopurulent discharge from the glands of Bartholin usually means gonorrhea. Simple redness of the ends of the ducts, the so-called maculæ gonorrhæicæ are not considered by Bumm enough for the diagnosis, but redness plus pus is sufficient. Abscess of the glands of Bartholin, however, is almost surely gonorrheal. A granular vaginitis speaks for gonorrhea. The presence of cervical erosions and condylomata is significant. Corroborative but not certain

diagnostic points are furnished by a mucopurulent infection of the cervix plus a urethritis. The latter causes a more or less continuous discharge from the urethra, the presence of shreds in the urine, etc., but a chronic inflammation of the urethra is often evidenced simply by a milky secretion, which can be obtained only if the patient does not urinate for several hours. With a gonorrheal cystitis there is an acid urine.

The diagnosis of the chronic form is difficult, for often no gonococci are to be found. Sänger looks for acute or chronic gonorrhea in the male. Purulent catarrh with other causes excluded is of importance. Inflammation of the Bartholin glands and the presence of maculæ and condylomata are important diagnostic aids.

A purulent or mucopurulent discharge from the cervix and evidences of inflammation of the adnexa and the peritoneum are most valuable diagnostic points.

Treatment.—In the acute stage rest is most important. Cold applications or the rubber coil are applied to the abdomen. If peritoneal irritation is present, an ice-bag is used. The intestines are emptied by enemata and opiates are given. If there is much discharge, cool vaginal oxycyanide of mercury, 1:5000, douches are given under low pressure. When there is high fever and little discharge, intrauterine iodin irrigations with a double-running irrigator are permitted in post-partum and abortion cases if the adnexa are free of inflammation. With the double-running catheter 1 to 2 quarts of various mild antiseptic solutions are used and at a temperature of 70° to 80°.

In the subacute stage when the fever has subsided, instead of renewed cold applications to the abdomen, a stimulating application in the form of a Priessnitz bandage is used every night. Tepid vaginal douches are given, and sitz-baths at the bedside, of a temperature of 70° to 85° and lasting five minutes, are sometimes ordered. Rest in bed for several weeks is important.

In the chronic stage of gonorrheal endometritis as much as possible should be accomplished without intrauterine treatment. By increasing the circulation in the uterus, increasing the tone of the myometrium, and thorough douching away of the discharge from the vagina, the condition can be markedly benefited,

If there is no purulent inflammation of the adnexa or parametrium or perimetrium, this is accomplished by hot douches given with large amounts of fluid, by hot sitz-baths lasting half an hour, and especially by carbonated salt baths. Intracervical applications of the negative pole of the galvanic current, using 6 to 12 milliamperes of current, stimulates the circulation and promotes glandular secretion. Discharge of the secretion is aided by suction and by glycerin and gauze vaginal packing (Figs. 13, 104). This may be followed later by local treatment of the cervix, combined with cold water vaginal irrigation. The latter consists of daily douches of 80°, gradually cooling subsequent douches down to 60°. If bleeding is a symptom, several douches with 1 to 2 quarts of hot water should be given daily. If this does not help, and if the adnexa are normal, the use of local medical treatment and irrigation of the uterus is advised by many, although I personally disapprove of these methods in the vast majority of cases.

In gonorrhea of the uterus, Joseph washes the cervical canal three times a week, with the aid of the speculum, with protargol ¼ to ½ per cent., or some other organic preparation of silver. He advises daily irrigations with a double-running catheter, using one quart of bichlorid of mercury 1:5000. He introduces into the cervix with Playfair sounds 20 per cent. chlorid of zinc or 4 per cent. formalin and packs the vagina with a glycerin preparation. If the gonococci continue to be present in the cervical secretion, the condition has probably extended into the uterus. He then uses the Braun syringe and injects into the uterus every three to four days a mixture recommended by Asch, which consists of:

℞. Alumnol ..... ℥ij
Lanolin ..... ℥iij
Aq. dest.
Glyc ..... āā ℥vj

Or else he irrigates the uterus with a double-running catheter, using a 5 per cent. solution of ichthargan, or else he introduces 25 per cent. protargol suppositories into the uterus. Suppositories 3 to 4 inches long and ⅛ to ⅜ inch in diameter can be

readily made by any druggist with a base of cacao-butter. They are of value in a base of 95 per cent. glycerin and 5 per cent. stearic acid, or in a base of boroglycerid and gelatin but these two forms demand a special piece of mechanism for their manufacture. Protargol suppositories with these bases (protargol up to 2 per cent.) are sold by various wholesale drug firms.

Finger advocates radical treatment of gonorrheal endometritis to avoid extension to the tubes. After the acute stage is over irrigations and instillations are used, with or without previous dilatation of the cervical canal. Sinclair recommended the application of tincture of iodin on two or three successive days, which is followed after the discharge of a membrane by renewed applications.

Finger introduces into the cervix on a Playfair sound, 5 to 10 per cent. protargol or ichthargan, and in chronic cases tincture of iodin or 5 per cent. acidum trichloraceticum. Siredey recommends 1 per cent. picric acid.

When gonorrheal infections extend up into the higher areas of the uterus, as a rule they do so (1) as a result of injury, such as excessive coitus, which means congestion and continued infection; (2) through work or effort; (3) during menstruation. I do not practice intrauterine treatment, for it injures the tissues, aids the migration of the cocci, and extends the infection. No applicators and no sounds should be used. Treatment should consist of rest, sitz-baths, vaginal packings, and douches. Protargol, oxycyanid of mercury, mercurochrome 220, and ichthyol solutions are recommended. The cases which are hardest to cure are those where the mucous membrane is covered by squamous epithelium and the discharge consists mainly of squamous epithelia.

In treating cervical gonorrhea Bumm makes incisions in the external os, if it is narrow. When the incisions are healed, he clears the cervix of mucus and applies 1 to 5 per cent. silver nitrate at one sitting, until the whole lining becomes white. Ichthyol 5 to 10 per cent. is then applied on cotton or gauze. When the resulting membrane finally comes away, he repeats the cauterization with silver or with chlorid of zinc, and ofttimes

the patient gets well. If it does not heal or if there are signs of endometritis, he treats the uterus carefully unless the adnexa have been recently affected. If this is the case, he lets even the cervix alone, *for care should be taken to avoid extension to the tubes.*

He begins intrauterine therapy, even with women who have had children, with dilatation of the internal os by laminaria in order to get good drainage. Then he swabs out the secretion and applies 1 per cent. silver or 1 to 3 per cent. ichthyol with Playfair sounds covered with cotton. He makes the application for ten minutes. Injections with a syringe are not advisable. He also uses daily irrigations with a double-running catheter for fifteen minutes to wash out all the folds of the endometrium. He uses silver 1:1000 or ichthyol 1:100. Sometimes the cocci disappear very soon, but *sometimes they reappear after treatment is stopped*, in which event treatment must be continued for weeks. Topical applications of colloidal silver are extremely useful.

When there is a chronic uterine gonorrhea with many squamous epithelia in the secretion and cocci in groups on the epithelia, stronger solutions must be used, such as tincture of iodin, silver 10 to 20 per cent., or strong chlorid of zinc. The resulting strong reaction after such a thorough cauterization, which should be done only once a week, throws off the cocci. *If fever occurs on the day of treatment or if there is increased sensitiveness of the uterus, treatment should be stopped for a while.* (Bumm.)

While for a time the gonococcus infection may remain limited to the cervical mucosa, it must be admitted that it is extremely difficult to tell in some patients when the invasion has encroached upon the uterine cavity. Boldt has, therefore, placed himself on the side of those who at once attack the entire uterine mucosa. If the patient permits it, he puts her under an anesthetic and disinfects the genital tract, and then, before proceeding to dilate the cervical canal, the uterus is copiously irrigated with a double-current catheter; then the cervix is dilated slowly and gently, but effectually, and a thorough curettage is done with a sharp curet, preferably a Martin curet for the first general abrasion of

the mucosa, followed by a small sharp curet used around the tubal openings. The uterus is again copiously irrigated with plain sterile water or a mild antiseptic solution, and is tamponed with a long strip of gauze soaked in 5 per cent. solution of soluble silver (protargol). Gauze soaked in 3 per cent. methylene blue may be used in the same way. The rest of the genital tract is tamponed with iodoform gauze and the patient put to bed. If urethritis is still present, it should be treated at this time, and also the ducts if infected. The gauze is removed on the following day, and on the third day the entire treatment, with the exception of the curettage, is repeated. If curettage is refused, office treatment is used. An intrauterine application is made by means of the intrauterine applicator syringe. The intrauterine tampon is left in the uterus for two or three hours and the patient directed to remove it by means of the attached strings. A medicated tampon is placed in the upper part of the vagina and is held in place by a plain, non-absorbent wool tampon. The strings of the tampon are so marked that the patient knows which to remove first. After removal of the tampon a copious antiseptic douche is used by the patient. This treatment is not as desirable as the first, as it is fraught with more risk of causing subsequent pelvic inflammation. The treatment should be repeated every two or three days, and the advantage of a perfectly made intrauterine applicator cannot be overestimated (Figs. 67, 68).

In cases of menorrhagia complicating gonorrheal endometritis, Boldt finds patients benefited by the internal administration of cotarnin hydrochlorate (stypticin), in dose of 3 grains given in gelatin capsules three times daily, if the previously instituted treatment does not have the desired effect. Alone, without local treatment, especially curetting, he finds that it gives unsatisfactory results.

In that class of patients in whom metrorrhagia and menorrhagia are almost uncontrollable, he awaits a non-bleeding period, and then makes intrauterine applications of pure carbolic acid, leaving the intrauterine tampon *in situ* for a couple of hours. The treatment is repeated every second day until six or eight treatments have been applied, and at the end

of the next menstrual interval it should be repeated. He has had no untoward results from the application of pure carbolic acid to the uterine cavity.

GONORRHEA OF THE TUBES, OVARIES, AND PERITONEUM

The tubes may be affected by a rapid upward extension of an acute gonorrheal infection in the course of a few days. Only the virulent cases cause early symptoms, because they affect the whole tube up to the external ostium. An invasion of the tubes, if relatively acute, and if accompanied by peritoneal lesions, is generally recognized as a peritoneal involvement. Acute cases have fever, due to inflammation of the deeper structures of the uterus, of the connective tissue, and of the peritoneum. Then there is pain, tenderness, slight rigidity, sometimes slight abdominal distention and pain, and colicky pains which are not due to the tubal affection but to the associated metritis.

Acute Salpingitis.—There are cases of gonorrheal salpingitis in which adhesions are very rapidly formed and the exit of pus is limited, without marked involvement of the peritoneum. There are other cases in which the pus is poured out rapidly and in large amounts or else adhesions do not form readily, and in which the amount of purulent discharge into the peritoneal cavity is so great that a more extensive peritonitis takes place. In several well-authenticated cases a so-called general purulent gonorrheal peritonitis has resulted.

The peritoneum is not an epithelial tissue and is much more resistant to the invasion of the gonococci than mucous membrane. A mechanical injury or irritation of the peritoneum predisposes to gonorrheal infection, however. In gonorrheal pelveo-peritonitis the serosa of the pelvis, of the uterus, and of the adnexa are highly injected and covered with a layer of cloudy, pus-like fluid, which is also present in the sac of Douglas. This exudate contains pus and intracellular gonococci. The posterior surface of the uterus and the ligamenta latum of either side are covered with this white membrane, which can be lifted off in small pieces. The serosa, thus uncovered, is rough, dark red, and looks like eroded tissue. These pseudo-

membranes prove to be composed of pus cells, fibrin, and intracellular gonococci. Out of the abdominal end of either tube comes a white creamy pus containing gonococci. The tubes and ovaries are swollen and congested, having a dark blue, almost gangrenous appearance.

The degree to which the peritoneum is irritated, and especially the degree to which closure of the abdominal end, with the formation of adhesions, takes place, is of the greatest variability. Tubes may heal and pregnancy may occur, so long as the ends are not permanently closed, and especially if they are not covered by adhesions.

Pyosalpinx.—With these acute attacks, if the outer ends are closed or if adhesions form at once, acute pyosalpinx may result. Sometimes this condition results in a one-sided pyosalpinx, while the other tube may seem normal. Such patients generally remain sterile, and at a later period the other side may become affected, but not to the degree observed in the earlier acute involvement.

Cases of chronic pyosalpinx with much pus accumulation are only too often the result of recurrent attacks brought on by excessive coitus, physical work and strain, intrauterine treatment, curetting, abortions, etc. Here a state of chronic invalidism may result, due to extensive adhesions involving the omentum, sigmoid, intestine, etc. If pus pours out rapidly from the tubes, especially in recurrent attacks, the adhesions are of a firm character.

The peritoneum may become infected by the cocci passing through the tubal wall. Orthman, Menge, and others failed to find gonococci in the wall of the tube, but Wertheim found them up to the peritoneum. Bumm thinks this is unusual. Wertheim believes that the cocci often pass through the tube wall into the peritoneal cavity, and he thus explains fresh recurrent attacks of pelvic peritonitis in cases where the tube ends are closed. Bumm says that the tube ends probably open by pressure from within the tube.

Gonorrheal infection of a mild degree of virulence generally passes upward slowly before or after labor, curetting, or abortion. Recurrent mild attacks may be produced by intrauterine

treatment or by the curet, and these factors have most to do, in the subacute cases, with extending the inflammation up to the peritoneum and causing adhesions. Those cases of subacute gonorrheal infection which suffer the most pain have been so treated.

The gonococcus may infect the ovarian follicles and may produce ovarian abscess. The ovaries, however, may be slowly and mildly infected and become diffusely inflamed and adherent. The ripening of follicles is then made difficult; they often degenerate into cysts and the ovaries are indurated. When so affected, the secretory activity of the ovaries is altered and menstruation may occur every six, eight, or ten weeks.

Treatment.—The treatment of acute involvement of the tubes, ovaries, and peritoneum means *rest in bed*, gentle catharsis, daily enemata, the ingestion of large quantities of fluids, the use of the ice-bag or ice-coil, and the usual methods of antipyretic treatment. Cool or tepid vaginal douches, under low pressure, of 1:5000 oxycyanid of mercury, or mercurochrome 220, 1 per cent., should be given two or three times a day and the associated vulvitis or cystitis should be treated according to the manner explained in the sections dealing with gonorrheal vulvitis and gonorrheal cystitis. Very careful vaginal or rectal examination should determine the character and extent of the involvement and the presence of a peritoneal exudate. In the vast majority of cases of gonorrheal peritonitis the condition is localized in the pelvis. A relatively small number of cases have been reported of general gonorrheal peritonitis. The prognosis is extremely good in all cases with conservative treatment. Only the cases of mixed infection associated with general peritonitis furnish a mortality. In cases of general peritonitis due to gonococci it is wise to defer operation until the active inflammation has subsided, although occasional laparotomies have been done with favorable results. Conservative treatment, however, is sufficient, except when the diagnosis of the cause is doubtful.

The following view of Bumm is rational: A gonorrhea freshly infecting a patient with adnexal disease means that the patient should stay in bed for *two months* and should be allowed

to get up only when every bit of inflammation is gone and when, *for four weeks, there has been absolutely no rise in temperature.* Treatment also includes sitz-baths, douches, glycerin tampons, and a "cure," but should be begun only months after the acute attack. A too early "cure" often starts up an extension of tubal trouble.

When gonorrhea complicates pregnancy there should be no treatment except perhaps douches, and the patient should stay in bed four to five weeks after labor, until complete involution takes place.

Boldt says: "In acute gonorrheal infections of the adnexa, with or without invasion of the pelvic peritoneum, rest, the application of the ice-coil or ice-bags, a narcotic, perferably in the form of suppositories, for the purpose of lessening peristalsis, and the avoidance of subsequent local examination should be insisted on until the acute symptoms have subsided, when one may begin with warm vaginal douches containing a mild antiseptic. The cold applications should be continued until the temperature is normal and the patient is free from pain. The patient should not leave her bed until the temperature has remained normal for one week, and upon any exacerbation of symptoms the rest treatment should be resumed.

"If at any time the Fallopian tubes become distended with pus, and sink to the floor of the pelvis, further delay with conservative treatment should not be practised. The patient should be anesthetized and the cul-de-sac of Douglas widely opened. The tubes should then be incised and evacuated. There is a class of patients who, while they make a temporary recovery, have more or less pain, either constantly or at varying intervals, with menstrual irregularities and perhaps occasionally acute exacerbations. Bimanual examination reveals evidences of salpingo-oöphoritis with a metro-endometritis. The Fallopian tubes are more or less distended, and sometimes the adnexa and uterus are matted together in the perimetric exudate. It may be impossible in these cases to demonstrate the presence of gonococci." In these cases local treatment has proved useless in Boldt's experience. For him, surgical intervention is the only form of treatment that holds out hope.

"There is another class of patients in whom the disease has to a large extent become spontaneously cured, so far as pyosalpinges are concerned, but the residue of the old chronic pelvic inflammation, consisting of tubes thickened and adherent, ovaries in a constant state of inflammation, and uterus perhaps smaller than normal, in some cases larger. Menstruation with this class of patients is likely to be at longer intervals—six weeks to three months; though in some instances it may be frequent, at intervals of two or three weeks, and the amount of blood lost variable. Severe dysmenorrhea may be present. Local therapy seldom benefits this class of women, who usually have been sterile or have but one child. If their suffering makes it difficult for them to pursue their vocation, and they are past the middle thirties, a radical vaginal operation is most expedient. If younger, then a salpingo-oöphorectomy should be resorted to."

CHARACTERISTICS OF GONORRHEA

For many years Bumm and Wertheim have been the leaders in a controversy concerning the relation of the gonococcus to the tissue on which it is implanted. Bumm assumes that in the vast majority of instances the gonococcus is a parasite growing on the superficial layers of the various mucosæ. For instance, he states that in chronic cervical gonorrhea the gonococci are limited to isolated small areas of mucosa in which the gonococci are situated in metaplastic squamous epithelium. The epithelium of the glands he believes to be generally immune, holding also to the belief that while the duct of Bartholin may be invaded by gonococci, yet the gland of Bartholin itself is not so affected. In the uterus he finds the mucosa affected, as a rule, in localized areas and only superficially. On the other hand, Wertheim states that the gonococci may enter the subepithelial connective tissue in any case.

There is no doubt that neither the contention of Bumm nor that of Wertheim forms an absolute rule. Different individuals react differently to the invasion of the gonococcus, and the amount of the discharge, the acuteness of the inflammation, the depth or extent of the invasion, the duration of the affection, and the results of treatment in the various forms of this inflammation differ markedly. Gonorrhea may be acute or subacute,

it may be recognized or not, it may be localized or diffuse, it may be superficial or deep. These various combinations depend on the virulence of the gonococci, the susceptibility of the individual's tissues, the degree of congestion existing before infection, etc.

The Light Form.—Bumm divides gonorrhea into a light form and a severe form. He says that the distinction is not due to a difference in the virulence of the gonococci, but to the element of localization. The light cases, says Bumm, are those in which only the cervix or urethra is affected. The more severe cases are those in which the infection has extended above the internal os of the uterus or has invaded the posterior portion of the urethra. While this difference of localization does make symptoms light or severe, there is certainly a difference in the resistance of patients and in the virulence of the gonococci.

The Severe Form.—In those cases which are acute from the beginning, and in whom there is an upward extension, or in whom recrudescences of the original acute attack recur, we find pyosalpinx, infiltration of the uterine wall, abscess formations, peritonitis, etc. In them, of course, the acuteness of the inflammation attracts attention to the nature of the infection, and the subsequent annoyances of pain and sterility are readily understood. Many women, however, in whom upward extension has taken place, if the upward extension occurs late and is of a mild nature, suffer neither from pain nor sterility, or else from sterility alone. (*The vast majority of cases of gonorrhea in women are acquired from a male urethritis or prostatitis which gives few or no symptoms, or from cases in which a chronic gleet has been examined by a physician who, finding no gonococci present, considered the patient, according to previously accepted standards, cured. This is the error which aids in the wide spread of gonorrheal infection of the female.*)

In further proof that the gonococci may enter the subepithelial connective tissue in any case, Wertheim has shown that they are found, for instance, in the subendothelial connective tissue of the peritoneum, in the bladder-wall, in the wall of the vagina. They have been found in the connective tissue of the synovia, in gonorrheal arthritis, in the tube walls, in

edema of the foreskin, in myocarditis gonorrhoica, in endocarditis gonorrhoica. As a general rule, the gonococcus causes no pus in connective tissues, but can do so, as in ovarian abscess, periurethral and perichondrial abscess, in abscess of the uterine wall, in abscess of the cervical glands, abscess of the dorsum of the metacarpus, about the knee-joint, etc. As a factor in mixed affection the gonococcus has been found in cystitis, arthritis, Bartholinitis, parametritis, and in some cases of adnexitis.

Characteristics of the Gonococci.—When growing on a mucous membrane, where new medium is constantly produced by continued secretion, the gonococcus thrives better than when encapsulated in an abscess, in which event the cocci may die, affected by their own toxins or by the action of other bacteria. As early as six weeks after an acute gonorrheal infection, gonococci were absent in a pelvic abscess which had been opened. Just as in a culture-medium colonies of gonococci die within one or two weeks if not transplanted, so the gonococcus in a chronic case becomes weakened in virulence so far as the affected individual is concerned. Being nourished, however, by continued secretion, it does not die, but becomes less virulent, adapts itself to the bearer, and a chronic or subacute inflammation results. Transplantation to fresh media prolongs the life of colonies of gonococci. When the gonococcus is removed from an infected region to a new area by the irritation of coitus, labor, exertion, or treatment, and especially if it is transplanted to a new individual, it produces a more acute inflammation. In the latter instance, if retransplanted again to the first bearer, it may cause a sharper inflammation on the basis of the chronic form (rule of Wertheim).

Mixed Infection.—The gonococci pass down between the cement substance of the epithelial cells and therefore are not easily washed away. They pass down to the subepithelial tissues and generally stop there. For this reason gonorrhea is frequently a superficial process in the genito-urinary tract, but by no means always so. Wertheim and others have shown that gonococci may produce pus in the connective tissues. Bumm says that this is rare, and that it generally means a *mixed infec-*

tion. In acute gonorrhea the microscope shows gonococci alone, but cultures, he states, show other bacteria, especially those of the pyogenic form. These mixed inflammations, as he then views them, evidence the presence of the staphylococcus aureus or the streptococcus. According to Bumm, they change the original character of the gonorrheal infection and produce abscesses in the connective tissues, in the vulvar and urethral follicles, in the glands of Bartholin. They may produce purulent parametritis, pyemia, etc. He disagrees with Wertheim, because he believes in the superficial nature of the inflammation, but he acknowledges that metastatic conditions may occur in the joints, usually in the knee-joints, but sometimes in all the joints. He also acknowledges the existence of endocarditis. We see, therefore, that gonorrhea may be acute or subacute, localized or diffuse, superficial or deep.

Epidermis-like squamous epithelium offers great resistance to invasion by the gonococci. These cocci, however, readily pass through cylindric epithelium, even if of several layers. In the rectum, for instance, they grow down to the muscularis. They may increase in connective tissue and cause an intense inflammation. The desquamation of epithelium mixed with polynuclear leukocytes coming from the capillaries produces a catarrh if there is an outlet for the discharge. If the outlet of a duct is closed by a drop of pus or by atresia, then pus accumulates in the gland (prostate, Cowper, Bartholin) and the periglandular tissue is invaded, and a pseudo-abscess results. A real gonorrheal abscess may be produced by the gonococci in connective tissue. Such has been noted in muscle abscesses, subcutaneously near joints, in the perineum, in skin abscess, etc. Therefore these complications may occur through the action of the gonococci alone.

However, other bacteria are often found in gonorrheal pus. Staphylococci are found in the pus of gonorrheal involvement of mucous membranes and in periurethral abscesses. Streptococci have been found in Bartholin abscess and in gonorrheal pyosalpinx. Therefore, in addition to complications occurring through the activity of the gonococcus only, there may occur mixed infections or secondary infections. In mixed infections

the gonorrheal involvement of a mucous membrane furnishes a portal for the entrance of pus cocci. In secondary infections the gonococci cause a complication, and later pus cocci enter and supplant the gonococci, which disappear. Metastases by gonococci may occur through the lymph-channels or blood-channels.

Extension of the Gonococci.—Wertheim says that isolated affections of the cervix are rare and that the infection extends up into the uterus more often than is suspected. Bumm, on the other hand, says that isolated cervical gonorrhea is of frequent occurrence. It may later affect the uterus, in which event it produces marked symptoms. He says that the internal os forms an obstacle, but if this point of limitation is passed, the symptoms are much more severe. The causes which transmit the cocci into the uterus are menstruation, overactivity, excess in venery, the use of the sound, the use of the curet, the puerperium, etc. After the gonococci pass the internal os they generally stop at the tubal ostia, but the same causes mentioned above may produce an extension into the tubes, etc., for the gonococci of themselves have no power of motion.

Virulence of Gonorrhea.—The difference of opinion is to be reconciled by realizing that the virulence of a gonorrhea in the female depends on the character or virulence of the gonorrhea in the male at the time of the production of infection. A most important fact is that on which Döderlein also lays stress.

Döderlein says that acute gonorrhea in the female comes from acute gonorrhea in the male, and that subacute gonorrhea in the female comes from a chronic condition in the male. The latter has none of the symptoms of the acute form, often only presenting a discharge. There may be no pus cells in the male secretion, there may be only isolated cocci in the urethra or in the threads, and for that reason the gonococci are mixed with the seminal fluid, and rarely infect the urethra, but infect the cervix alone. Such light cases do not cause pyosalpinx, and by no means do they always cause sterility if no accessory irritation has occurred. (When gonococci are present in large numbers, we find no other bacteria. As the gonococci diminish, other bacteria come into the field.)

Changes Produced by Gonococci.—The characteristic change in gonorrheal infection is round-celled infiltration, and regeneration is associated with the formation of squamous epithelium. If squamous epithelium is found in a long-continued discharge, this change is of bad prognostic meaning. Chronic gonorrhea of the cervix and uterus, according to Bumm, means the presence of mixed bacteria together with the gonococci. In chronic cases the gonococci may remain on the surface of the new squamous epithelium. There is caused a scanty but steady secretion which may be increased by irritation, and the cocci may take on a new growth. Their presence in the pus cells does not represent phagocytosis; on the contrary, the gonococci destroy the protoplasm which is rich in peptone. They grow well on the surface. On the other hand, they die quickly in a closed pus cavity, as in an obstructed Bartholinitis or in a pus tube.

Gonococci in Relation to Pregnancy.—Localized cervical gonorrhea does not affect conception. In chronic gonorrhea of the uterus Bumm sees no obstacle to pregnancy if the tubes seem normal. Even if the tubes are affected, they may subsequently return to the normal. On the other hand, it may be said that the tubes may be affected and yet seem normal on bimanual examination. Bumm says that chronic gonorrhea in the second half of pregnancy generally goes on without symptoms. In the earlier months the presence of the gonococci may cause abortion or disease of the decidua. If gonorrhea is acquired during pregnancy, the infection remains in the urethra or cervix, but has a marked tendency to produce abscess in the glands of Bartholin. The gonococci always increase markedly during the post-partum period.

Krönig examined one hundred and seventy-nine cases of puerperal endometritis and found gonococci in the lochia of fifty. They increase in the first few days and then disappear entirely or gradually. Bumm says that while in the cervix of pregnant women cocci may be found only in small numbers, yet in the lochia from the cervix on the second to the fifth day post-partum they are found in huge numbers and the cocci are large and plump. Toward the third week of the puerperium

they are hard to find if the secretion becomes mucoid. In some cases it is easy to find them for weeks if the secretion is not mucoid. In the early puerperium there is generally no fever or other symptoms. If there is temperature, it is very low and lasts but two or three days. This is either due to an absence of extension or to a slow extension or to slight virulence. In the later puerperium, after the patients get up, there is observed a marked tendency to an ascending inflammation, as was first pointed out by Sänger. Then we get metritis, parametritis, and salpingitis. Fever occurring late in the puerperium, with symptoms of localized peritonitis, suggests gonorrhea. Many women go through several labors without an upward extension from the cervix or even from the uterus.

The pioneer in the field of gonorrhea in observing its wide spread among all classes of society is Noeggerath, who set down his views in his work, "Die latente Gonorrhöe" (Max Cohn & Son, Bonn, 1872). According to Noeggerath's original opinion, three out of five married women have gonorrhea, but he later modified his figures. According to Kehrer, one-third of the sterile marriages are due to the male through azoöspermia or oligozoöspermia which can generally be referred to epididymitis. Bumm quotes E. Schwartz as saying that of one hundred men, ten carry a chronic gonorrhea into the marriage state, while ten more acquire a fresh gonorrhea after marriage, so that one woman in five becomes infected. Bumm says that, according to statistics, 12 per cent. of marriages are sterile. On the basis of Noeggerath's figures, it would appear that 8 per cent. of all marriages are sterile because of the gonococcus. One hundred and ten cases of primary sterility gave Bumm only 30 per cent. as due to gonorrhea. *He says that very many women with cervical gonorrhea bear several children.* Gonorrhea, according to him, plays a greater rôle in the production of secondary sterility. When examinations are made by various observers in obstetric clinics, gonococci are found in pregnant women in from 12 to 30 per cent. of the cases. If we could add together (1) the cases of primary sterility in which spermatozoa are present in the male, (2) cases of secondary sterility (which are generally not included under statistics of sterility), (3) many cases of ectopic

gestation, (4) cases of gonorrhea localized in the cervix in patients who are not sterile, (5) cases with gonococci in the lochia in whom sterility does not take place, (6) cases operated on for gonorrheal disease of the adnexa, and never classed under sterility, but called pyosalpinx, etc., I am sure we would agree that a very much larger percentage of women suffer from gonorrheal infection than is believed.

Difference Between Gonococci and Pus-producing Cocci.—The gonococci differ in their activity from the pus cocci. The pus cocci enter tissues more intensively than do the gonococci. The pus cocci grow faster and make their way independently. The gonococci, being weaker, seek interepithelial passages, connective-tissue spaces, and cavities. They have less energy than the pus cocci. Gonorrheal inflammation is purulent. The gonococci cause much granulation tissue early and the inflammation becomes subacute. There is a tendency to the formation of connective tissue, resulting in scars and strictures. The gonococci are easily destroyed by high temperature and by fever. Therefore the gonococci, as compared with pus cocci, are weaker, more readily affected, and produce more benign acute processes.

GONORRHEA IN THE MALE

The secretion after a recent gonorrhea in the male contains shreds, which result from catarrhal desquamation of epithelium, and polynuclear pus cells held together by finely granular mucin. Cloudy urine results from a diffuse catarrhal affection of the mucosa and glands with degeneration of the epithelia. Shreds, pus, cloudy urine, signify a recent, still diffuse urethritis.

The older the process, the slighter are the diffuse catarrhal changes, the less is the hyperemia, and the less is the mucus. Only localized areas then produce a secretion which consists of epithelial cells and pus cells held together by mucin and appearing as shreds. Shreds in clear urine signify chronic gonorrhea. If such a form is irritated, catarrhal symptoms (hyperemia and production of mucus) start up again about the fixed chronic areas and then disappear.

In acute purulent gonorrhea of the urethra in the male gonococci are present. In the chronic form it is often hard to find them in the shreds or in the "pus drop." One may examine for days and find various bacilli and cocci and no gonococci. If an exacerbation of the process occurs, then in the increased pus we may find gonococci easily, while the other cocci disappear. This disappearance is constant. In acute cases no bacteria, or very few bacteria or cocci other than the gonococci, are found. We can artificially produce an exacerbation by the use of silver nitrate.

There are cases of male gonorrhea where, in spite of frequent examinations continued for several weeks, and in spite of one or more artificially produced exacerbations, no gonococci can be found. The pus and shreds show no germs or else other germs, but no gonococci are present. We may come to the conclusion that the gonococci have disappeared, but that the changes produced by their presence continue. In many cases of chronic gonorrhea examination of shreds shows no gonococci and no other germs. In some cases, even as early as the terminal stages of an acute gonorrhea, other micro-organisms are found in addition to gonococci. This is often the case in chronic gonorrhea. Generally they are bacteria of various length and thickness. There are cocci in short chains and groups. These bacteria enter the urethra in coitus and grow on a diseased mucosa and may keep up a chronic stubborn catarrhal discharge (Finger).

It should never be forgotten that the prostatic gland may harbor gonococci for months and years, and the patient still remain free from symptoms. The prostatic should be massaged repeatedly and the prostatic secretion examined several times before a man is pronounced cured.

Streptococci, staphylococci, and bacterium coli have been found in shreds and in the secretion of the posterior urethra. These may infect the female and cause a cystitis and pyelitis.

Views on Marriage.—Finger allows marriage after chronic gonorrhea (morning drop or shreds) "if repeated daily examinations of secretion and shreds show that these contain only epithelia and *no pus cells*, and if, after irrigation with silver or

mercury, and the production of a purulent discharge, the discharge shows no gonococci. The absence of gonococci, the absence of pus cells, the absence of periurethral complications are essentials. *So long as the secretion or shreds contain pus cells we know that inflammation has not ceased.*" While inflammation may continue even where the original cause of the trouble (the gonococcus) is gone, "yet this is not the case so very often." Never forget that gonococci may lie dormant in the prostate gland for a long time. *A negative result, i. e., the inability to find the gonococcus, does not prove that no gonococci are present.* Finger advises against marriage so long as pus cells are present. Kopp, in seven men with chronic gonorrhea, found no gonococci in the secretion after fifteen to twenty-two examinations, and yet these men infected their wives. Jullien, Wossidlo, Finger, and others report infection of the wife in spite of the fact that repeated examinations showed no gonococci and in spite of the fact that cultures were negative.

UNRECOGNIZED GONORRHEA IN THE FEMALE

Readily as we diagnose gonorrhea in the male, just so difficult is the diagnosis of gonorrhea in the female. The element which attracts attention in the male is the primary urethritis, accompanied by pain, burning, and discharge. From this come all the subsequent troubles. Through this urethral channel the various genito-urinary complications arise. In the female the urinary and genital organs have separate canals, and urinary and genital involvements by gonorrhea may occur independently or may be of different degrees of severity. An originally acute localized involvement in women often attracts little or no attention. A subacute invasion may, and frequently does, attract no attention at all.

Urethritis.—An acute urethritis in the female often causes such slight annoyances that the patient does not seek the services of a physician. Acute gonorrheal urethritis in the female has a tendency to heal without treatment in six to eight weeks. In other cases the discharge gradually becomes less, the symptoms improve, but a secretion persists, either because of a deep involvement of the mucosa of the urethra or because of an

infection of the urethral glands. Such a condition often develops after an acute gonorrheal urethritis.

Many women suffer from chronic urethritis without any evidence of genital lesions, though in some cases there is an associated cervical catarrh. Massage of the urethra, several hours after the last urination, expresses a white, milky, mucoid discharge. The urethra may be sensitive and infiltrated. Examination of the discharge shows a few pus cells and a huge number of squamous cells of various shapes and sizes. Bacteria and cocci of different forms are often present, but very often no gonococci are found. There may be a history of relatively acute onset, the symptoms manifested at that time being frequency of urination and burning micturition. In some cases maculæ gonorrhœicæ are present or there may be distinct evidences of a cervical gonorrhea. The findings under the microscope in patients seen for the first time years after the beginning of their annoyance are exactly like those obtained in the acute cases which become chronic under observation. The clearest cases are nulliparæ in whom no pregnancy could have produced a septic involvement of the urethra, in whom there never was opportunity for the production of a catheterization cystitis, and in whom no fistulas are present. The absence of gonococci in the secretion and the presence of pyogenic cocci and bacterium coli is no reason for excluding an original gonorrheal etiology.

The vast majority of such cases are probably due to a previously existing gonorrheal infection.

Anal and Rectal Gonorrhea.—The unusual location of a gonorrhea may prevent its recognition at that particular point. Involvement of the anus and rectum by the gonococcus is by no means rare in children and certainly not in adults. Baer found that, in one hundred and ninety-one cases of gonorrhea, there was rectal involvement in 30 per cent. There is a sensation of heat and burning, increased on defecation, and characterized especially by fissures. In four cases in children and in many cases in adults suffering from fissure of the anus, with pain on defecation, sometimes accompanied by the presence of blood, I have been able to obtain smears in which the gonococci were

readily found. I have been surprised to find this condition in several cases in adults who complained only of the rectal annoyance and who had not the slightest subjective symptoms of a gonorrheal genital infection. That such a rectal and anal condition may exist without the finding of gonococci is to be expected, for a study of gonorrhea in other locations shows that eventually secretion is diminished or absent and the cocci disappear or cannot be found. In the majority of such cases we should find objective evidences of a cervico-uterine involvement.

Gonorrheal Peritonitis.—Because the symptoms resemble other conditions, a gonorrheal etiology is often overlooked. A gonorrheal infection in children may spread upward into the uterus, up through the tubes, and involve the peritoneum with such rapidity that the vulvovaginitis has scarcely time to attract attention. In other instances the vulvovaginitis causes so few annoyances that little attention is paid to it. Gonorrhea sometimes occurs with all the evidences of peritonitis and is sometimes very sharp in its onset, producing rigidity of the recti, pyrexia, pain, vomiting, and abdominal distention. In the absence of a recognized cause it is generally diagnosed as appendicitis, and frequently operation is performed for this indication. The rule should be formulated that every attack of peritonitis in female children which simulates appendicitis should have the gonorrheal possibility excluded. While operation is not followed by bad results, yet these cases improve on symptomatic and non-operative treatment.

The same point holds good in adults in those cases where there is rapid upward extension and infection, there being often no local symptoms whatever to call attention to the specific etiology. The symptoms are those of a peritonitis. In those instances in which adhesion of the tube does not occur quickly and in which the pus is poured out into the peritoneal cavity, and is accumulated in the cul-de-sac of Douglas, bimanual examination in patients with a very tender abdomen and with rigid recti, may give no tangible evidence of involvement of the adnexa. The diagnosis may then be in doubt. In such cases, where a local specific infection is not thought of, the diagnosis

of appendicitis is often made, and only operation discloses the real condition of affairs. In gonorrheal peritonitis the appendix is, as a rule, reddened, inflamed, and edematous, and if a small incision is made, the real condition may be overlooked.

A frequent cause of failure to recognize the existence of gonorrhea is due to the mild nature of the infection. If the first five days after labor are passed without a rise of temperature or pulse the probability of a post-partum infection of any sort is generally not feared. Yet there are cases where at the end of the first week, or more particularly at the second week, rises of temperature, not always high, are noted. Examination may show no marked parametritis, no involvement of the peritoneum, there may be no pain. Frequent and continued examination of the lochia will disclose in many of these patients the presence of the gonococcus. On the other hand, continued routine examination, persistently carried out, will often show the gonococcus to be present, even in post-partum cases, when no rise of temperature is noted (Krönig and Stone).

Such involvement results in the so-called "one-child sterility" and in changes in the tubes. A parametritis, especially localized along the tube and near the ovary, and constituting a paraoöphoritis or parasalpingitis, is very frequent, and very often remains undiscovered.

Gonorrhea is often unrecognized because the original characteristics have disappeared with the lapse of time.

Cyst of the Gland of Bartholin.—When an abscess involves the gland of Bartholin and requires incision, it is usually attributed to the gonococcus. While this is generally true, a diagnosis should not be made from this evidence alone. There are many instances of gonorrheal infection of the gland of Bartholin in which no abscess results. The duct is not closed and in the course of time the discharge becomes less purulent, finally becomes mucoid, and often of a normal color. If then atresia or obstruction of the duct occurs, a cyst of the gland of Bartholin results. While not generally so considered, there is no reason to doubt that many of these instances are to be referred to a gonorrheal infection of the gland, existing perhaps for years, and even

to be referred back to the time of childhood. Therefore the resulting cyst contains an accumulation in which no gonococci are found and which seems under the microscope scarcely pathologic.

Vulvovaginitis in Children.—The finding of purulent secretion and the absence of gonococci therein under the microscope does not exclude gonorrhea. Vulvovaginitis in children is attributed to various irritative causes, to saprophytes and bacteria, and to the gonococcus. In children an acute vulvovaginitis with purulent discharge, in which the gonococci can be found, is by no means infrequent. When the condition becomes less acute, although numerous pus cells are present in the discharge, gonococci are not so easily discovered. At a later stage, when the pus cells are still fewer in number, it is extremely difficult to find gonococci. In those long-continued chronic cases there is involvement of the cervix and of the uterus, and, as is also observed in adults, the microscopic finding of the gonococcus is by no means an easy procedure. The vaginal speculum in children shows a granular vaginitis and cervical erosion. Therefore these old chronic forms, as well as cases which are subacute and non-virulent from the beginning, are often considered, because of the absence of gonococcus findings, as due to other bacteria, whereas a large proportion of them are undoubtedly gonorrheal in origin.

The Diagnosis of Chronic Gonorrhea of the Cervix and Uterus.—In diagnosing chronic gonorrhea of the cervix and uterus in adults there are greater obstacles than those which hamper the genito-urinary surgeons in making their microscopic determinations. It is rare that a gleet or a pathologic prostatic secretion or threads in the urine indicate anything but an evidence of a previously existing posterior urethritis of gonorrheal nature. In women, other bacteria are concerned in producing inflammatory involvements after labor, abortion, induced abortion, etc. When looking for gonococci in the prostate one may use the so-called beer or coitus or silver tests, and by massage of the prostate may obtain a secretion showing gonococci. In women we are limited to frequent examination, especially after menstruation. The advisability of using intrauterine applications

for increasing the secretion is a matter of dispute, but when done is of great aid. In women we find still greater difficulty, for the cervical mucus makes the discovery of gonococci by microscope or by culture difficult or impossible. Gonorrhea in the female may heal to all intents and purposes. Fluor is reduced to a minimum and no evidences are present in the external genitalia. In fact, in the vast majority of cases no alterations are present in the external genitalia. A history, such as is always present in the male, is often absent. If in a chronic prostatitis gonococci cannot be found, and if the chronicity of the lesions is attributed to other associated bacteria or cocci, the disease is probably nevertheless gonorrheal in origin. The same is true in women, for when other bacteria and cocci come into the field the gonococci tend to disappear. We must parallel the experiences of genito-urinary surgeons and adopt the principle that the absence of gonococci in a pathologic cervical and uterine secretion, or even the absence of an evident secretion, by no means excludes the gonorrheal etiology of an active or passive, objective or subjective, alteration of an inflammatory nature.

Diagnostic Value of Intradermal Injection of Gonococcus Vaccine.—Vaccine injected into the skin shows a pronounced reaction, similar to the "stitch" reaction obtained by Hamburger and by Mannheimer in tuberculin diagnosis. London calls attention to the diagnostic value of this method of intradermal injection of a few drops of gonococcus vaccine, 50,000,000 to 100,000,000 per c.c. in saline solution. In positive cases, an area of erythema develops from one to three inches in diameter, in the center of which there is a small red papule, a little deeper in color than the surrounding areola. This central papule is really composed of two parts, one at the site of needle puncture and the other at the periphery of injection. Normal saline solution may be used as a control, but is not necessary, as London has used a few drops of a solution containing 500,000,000 per c.c. without any reaction in negative cases. Oftentimes the entire area of reaction is slightly elevated. Adjacent lymph-nodes are not enlarged. In negative cases there is no reaction or yellowish discoloration at the site of injection. The reaction appears in

from twelve to twenty-four to forty-eight hours, the central papule being the last to disappear (J. London).

Use of the Microscope.—The use of the microscope has done much to hinder the diagnosis of old or subacute cases of gonorrhea in adults. A casual examination which fails to detect negative Gram diplococci has in innumerable instances excluded gonorrhea as the cause. In old cases, the staining of numerous slides and several hours spent in their study are necessary to the finding of the much-sought-for cocci. When gonorrhea of the cervix and uterus becomes chronic, the discharge becomes less, and then mucoid or mucopurulent and mixed with many squamous epithelia which may contain cocci. When this occurs, says Bumm, the prognosis is doubtful, for the cocci may disappear for weeks and then reappear. The only symptom is discharge, which is mucoid and often yellow or green; yet, according to Bumm, gonococci may be present even when the mucus is clear.

Chronic gonorrhea of the cervix and uterus, according to Bumm, means the presence of mixed bacteria together with the gonococci, a fact which still further confuses an attempt at diagnosis by microscope or culture.

Clinical Diagnosis of Latent Gonorrhea.—Are we in a position to diagnose chronic gonorrhea clinically when few pus cells and no gonococci are found? I believe that certain cervical alterations are of importance in this connection, especially when a chronic urethritis is not present, when maculæ gonorrhœicæ or other external evidences are entirely absent, and when tubal and peritoneal changes are not marked.

Erosions of the Cervix.—This is a condition which is extremely frequent and is generally noted in nulliparæ suffering from cervical or uterine catarrh. It is due to the maceration and destruction of the squamous epithelium about the external os and its replacement by the cylindric epithelium which normally lines the cervix. When this condition exists in nulliparous women who have not been curetted, or in whom other means of infection are to be excluded, a gonorrheal infection must be considered. (For me, after close observation, the axiom has been adopted that cervical erosions plus a pathologic cervico-

uterine discharge in nulliparæ are presumptive evidence of cervico-uterine gonorrhea.) In addition to erosions, there is a characteristic cervical catarrh. The cervix is dilated, there is an extremely thick plug of mucus filling the cervix and protruding from the external os. Its color is white or yellow. With it there is a reddened external os, if erosions are not present. Examination of the secretion shows mucus, squamous epithelia, and many leukocytes. In this cervical type pure pus is not found. The mucus has a destructive action on all the cells which are taken up in its structure, and their form is changed. Bacteria are almost never found in the mucus. For that reason gonococci, unless the cervical wall is scraped or unless the uterus is involved, are almost never found. This condition is seen to develop in patients who have been treated for acute cervical gonorrhea, and is most frequent in those cases in whom the main activity of the gonococci seems to be limited to the cervix. When existing in nulliparæ and when present to a marked degree in uniparæ, it is extremely suggestive of the existence of a cervical gonorrhea, even if no erosions are present and even if no involvement of the adnexa can be made out. I base this opinion upon the fact that many such patients have salpingitis and oöphoritis, and on the finding in one-third of the cases of gonococci after prolonged examination.

Parametritis posterior is a very frequent condition. This is a lesion which occurs in nulliparæ, and especially in women who have borne one or more children. In the latter it often produces symptoms shortly after childbirth, but may give no symptoms then. It consists of a slowly progressive, chronic infiltration of the uterosacral ligaments and the pelvic connective tissue surrounding the posterior fornix. The parturient cases have only slight or no temperature reactions, suffer from pain in the back, convalesce slowly. Bimanual examination shows an exceedingly tender, edematous, or infiltrated posterior parametrium. There is also present a reddened external os and slight or large amounts of cervical discharge. Careful examination in these early cases often discloses the gonococcus. In other cases the gonococcus cannot be found, but the parallel with other instances makes this etiology extremely probable.

When this condition continues, there results a sclerosis of the uterosacral ligaments on one side or on both sides. Associated with it is a chronic cervical catarrh, though the latter in the course of time may so improve as to give only slight evidences. This condition is by no means infrequent in nulliparæ suffering from chronic cervical catarrh, in whom no factor other than the gonococcus can be referred to as the cause. Its presence in nulliparæ in conjunction with erosions, red external os, and pathologic cervical discharge justifies the diagnosis of gonorrhea. A frequent location of the parametritis is along the course of the tubes and near the ovary. It is responsible in many cases for an acquired ovarian dysmenorrhea with varicocele of the broad ligaments.

Use of the Curet.—Those who have observed the tendency to the indiscriminate use of the curet for the cure of primary sterility and for the cure of uterine catarrh have noted that in many cases the cervico-uterine catarrh did not improve, that in some cases it was made distinctly worse, and that in many cases the result of dilatation of the cervix and of the curettage was pelvic pain and temperature. Examination discloses an involvement of the parametrium on one side or the other, or an inflammatory involvement of the adnexa of one or both sides. In fact, a large proportion of cases of sterility associated with pain which I have had the privilege of observing are such patients as have been curetted for primary sterility. Infection of the usual septic character can often be excluded, and we are forced to the conclusion that dilatation of the cervix and curettage often arouse the slumbering cocci of a non-recognized gonorrheal catarrh of the cervix and uterus.

There is found in many women suffering from sterility, and especially in such as have been curetted for sterility, a mild one-sided or double-sided salpingo-oöphoritis, associated with pain in the region of the ovaries. In these cases there may exist erosions or cervical catarrh, or these conditions may not be marked. If tuberculosis can be excluded and if a previous appendicitis has not existed, the cause, in the vast majority of instances in nulliparæ, is to be referred to a mild gonorrhea. On operation those cases not infrequently show closure of

the tubal ends or cobweb adhesions around the tube and ovary which to all intents and purposes close the ends of the tubes. This condition is frequently one-sided, and after abdominal operation, and more frequently if a curetting be combined with the operation, an extension to the other side in the course of time is noted. In this condition there is not infrequently found small cystic degeneration of the ovaries. Particularly in those cases in which the ovary contains one large cyst the size of a walnut, and in which the broad ligament veins constitute a varicocele, the probabilities are that we are dealing with an infection of a ruptured Graafian follicle which, after its closure, becomes distended by the accumulation of secretion within it.

Sterility in very many cases is to be referred to lesions of the tubes. Given a sterile woman with well-developed uterus and ovaries (if the spermatic fluid is found normal), and, if stenosis of the cervix and the internal os can be excluded by treatment or operation, the cause of the sterility must be referred to the tubes. Such cases are frequently found after curetting. We may safely take it for granted that there exists a mild inflammatory involvement of the Fallopian tubes, perhaps only affecting that part close to the uterus, but quite sufficient to destroy the activity of the ciliated epithelium. As a result the ovum cannot enter the uterus and sterility is the consequence. In this way can be explained many cases of pregnancy occurring years after marriage, especially in those cases where treatment was finally given up and several years have elapsed, during which time the natural resistance of the patients has restored the tubes to a normal condition. The patency of the Fallopian tubes can easily be determined by the Rubin test (see page 53).

Ectopic Gestation.—The cause of ectopic gestation is to be referred, in the majority of cases, to some obstruction in the inner lining of the tube. There is either a mild fresh salpingitis or there is an old, nearly cured salpingitis. The ciliated epithelium in the outer end of the tube is not yet involved or else has been restored to normal activity, but beyond that the tube is either obstructed by adhesions of tubal mucosa or by an edematous mucosa or else the ciliated epithelium is not functioning. The finding of cilia in sections of the proximal area of

the tube has been very extensively used as a refutation of this causation. It may be said that finding cilia is no proof of their activity, for even in pyosalpinx in certain areas the ciliated epithelium is to be found. Therefore, an ovum given off from the ovary, if fecundated, passes along the tube up to the point where there is an obstruction or where ciliated epithelium no longer functionates, rests there, continues its growth, and ectopic gestation results. The occurrence of ectopic gestation after long periods of non-artificial sterility, the occurrence of repeated ectopic gestation, the frequent finding of adhesions or scars in the tube, and the by no means rare inflammatory involvement of the opposite tube speak for such a tubal alteration in many cases. In many cases in which at operation I paid particular attention to the opposite tube, there was found a closer outer end. Adhesions were present about that tube and ovary, *i. e.*, alterations of such a character as to warrant removal. That gonorrheal infection is the cause in a goodly proportion of cases is my opinion.

Course of Mild Gonorrhea.—The main reasons why the conditions referred to constitute unrecognized forms of gonorrhea are two: Either the original gonorrheal infection was so situated as to cause bearable annoyance, as is often the case with gonorrhea of the urethra, and involvement of the cervix, if both remain localized, or the situation is unusual and occurs with symptoms resembling other diseases, or else the original infection was of so mild a character as never to attract the attention of the patient at the time. Such is the history of the vast majority of infections which take place in the female. They are the result of old, chronic, supposedly cured or supposedly harmless involvements of the prostate or seminal vesicles. Such gonococci have a tendency to cause superficial infections, and there is nothing in the character of the infection to attract notice. In these mild cases the urethra is rarely involved, for the simple reason that the infecting cocci are mixed with the seminal and prostatic secretion and are deposited in the vault of the vagina. There results finally a cervical catarrh. Extension is favored by rough intracervical manipulation, by curettage, by operation, by labor, and by

abortion. In an acute gonorrheal involvement it is not easy after a certain period to find the gonococci extracellular or intracellular. In these milder cases it is extremely difficult to find them because of the mucoid character of the cervical discharge and because the cocci in the depths of the glands are not extruded without stimulation or irritation. Were such conditions to be found in multiparæ alone, it would be difficult to form a definite opinion. Even here, the fact that a woman has borne several children does not exclude the existence of a cervical infection. Many women with a cervical gonorrhea which remains localized go through successive pregnancies. It is probable that an involvement of this mild nature which does not, post partum, extend upward and involve the uterus, tubes, and peritoneum after the first labor, and which therefore permits of a second pregnancy, will, in all probability, never extend further than the cervical lining, and if it does so its course will be mild. When gonorrhea of the cervix and uterus becomes chronic, the discharge becomes less, and then mucoid or mucopurulent and mixed with many squamous epithelia which may contain cocci. When this occurs, says Bumm, the prognosis is doubtful, for the cocci may disappear for weeks and then reappear. The only symptom is discharge, which is mucoid and often yellow or green. The milder lesions referred to, and which affect the cervix, the posterior parametrium, the uterus, the peritoneum, and the ovary, are frequently found in women who have borne one child, but most frequently in women who are sterile. In the majority of such cases no other etiology than gonorrhea can be found. No etiology can be considered, except a mild infection from below by the gonococcus from a dormant male prostatitis. I have come to this conclusion from a study of cases acutely infected by the gonococcus and in whom the gonococcus was clearly demonstrated. In the course of months and years the original typical character of the inflammation changes to a type so often found on the first examination of long-suffering patients. Therefore, when such cases, particularly nulliparæ, are seen for the first time, and present the typical picture of erosions, of cervical catarrh, uterine catarrh, salpingitis, mild salpingo-oöphoritis, mild

tubal adhesions, and sterility, and if primary intraperitoneal causes can be excluded, the only conclusion to be reached is that we are dealing with subacute infection, probably by a non-virulent type of gonococcus. Examination of the husband will disclose a prostatitis or show threads in the urine or divulge the history of a new infection after marriage.

Virulence of the Gonococci.—Many observers will not grant that there is a difference in the virulence of gonococci. They say that when transplanted to new soil, any gonococci may cause acute infection. Mild attacks, they say, are due to the resistance of individuals or to the element of localization.

Bumm says that the severity of the infection depends on the localization; that gonorrhea is light if located in the cervix or urethra, and severe if it extends upward quickly. Bumm says that it is often isolated in the cervix, while Wertheim contends that it is in the uterus much more often than we realize.

On the analogy with other bacteria we have the right to predicate various degrees of virulence in different gonococci. It is natural to expect that gonococci few in number and found with difficulty in the male prostate years after the original infection may cause a less acute involvement of the cervix than the cocci from a fresh or recent gonorrhea in the male. While I have no warrant for this statement on the basis of experimental proof, it is the opinion of Döderlein that acute gonorrhea in the female comes from acute gonorrhea in the male, and that subacute gonorrhea comes from a chronic or subacute disease in the male. The subacute form has none of the symptoms of the acute form, often presenting only a discharge. With this statement I agree on the basis of clinical facts.

GENITAL SYPHILIS

By Walter J. Highman, M. D.

Syphilis, as appertaining to gynecology, is a relatively restricted disease. It occurs in all three stages on the external genitalia, of which the most important for practical consideration are the primary and secondary. The same is true as to the vagina and cervix. Gummata of the vulva, vagina and cervix are comparatively rare. So far as the internal generative organs are concerned, tertiary syphilis, although rare, is obviously the only form in which the disease can occur. Aside from its bearing upon the patient, it is important for the gynecologist to be familiar with the local manifestations of early syphilis, both for his own protection and for the safety of attendants in their care of the patient, under the gynecologist's guidance. It is because of failure to recognize syphilitic lesions, and the consequent absence of an attitude of mind that would automatically exist if aware of their danger, that there is frequently an innocent transmission of the disease to those engaged in the practice of medicine and in nursing.

The Initial Lesion.—The initial lesion occurs in various locations. Because of the mode of transmission, it is less frequently seen on the vulva than in the vagina, or on the cervix, and therefore women are usually ignorant of infection for a longer time than is the case in men. The consequence is that a greater proportion of women than men present themselves to the syphilographer after the secondary period has become florescent. Because of their anatomical peculiarities, men notice the chancre from its very inception. For this reason the gynecologist, and nurses caring for women, regardless of their patient's social status or any other sentimental consideration, should wear rubber gloves.

When the early lesions localize themselves upon the external genitalia, their type conforms to the conventional picture. It is perhaps less important to catalogue their technical names

than to describe the clinical variations of the chancre. The commonest form is the hard ulcer, which is a lesion that may be found with equal frequency upon the large or small labia, or at the fourchette. It varies in size from ⅛ to ½ an inch in diameter and, when typical, is stony hard and deeply infiltrated, the infiltration extending to the soft parts below. On the cervix it presents a shallow ulceration, the margins of which are precipitate and sharp and rarely undermined, the floor of which is either slightly saucer-shaped, oval, or even sometimes convex. When external, the lesion yields a thin, sero-purulent secretion which is highly infectious, malodorous, and which does not tend to form adherent crusts. As a rule the chancre is single, but multiplicity is by no means as rare as medical tradition would indicate.

The next most common lesion is a nondescript erosion which is particularly dangerous, because it looks like nothing in particular. It is as infectious as the first form, but presents nothing characteristic of syphilis, save its persistence during a long period. It, too, may be single or multiple, and its favorite site is on the mucous surface of the larger labia, or other portions of the vulva liable to excoriation during coitus. At times an erosion of this sort surmounts a dense cartilaginous induration below.

The third form is the nodule. This is a papular, hard, noneroded, non-ulcerating, lenticular lesion, of a vivid red, purple, or brownish color. It varies from the size of a lentil to that of a cent, and is covered by intact mucous membrane overriding a very hard, discoid infiltration also freely movable below. This lesion, too, may be single or multiple, and it tends to favor the same sites described in connection with the erosion.

Another form of the initial lesion is known as the indurated edema. The peculiarities of this are its extensiveness and voluminousness. An entire labium, and even the adjacent portion of the mons may be included in the process. On inspection, the condition seems to be a purely local edema. It is stony hard to the touch, covered by mucous membrane, and on the outer surface by skin that is intact, while in color there is rarely anything deeper than a vivid red. An acute inflammation is not suggested.

At times there may be a mixture of the various forms of the initial lesion. In these combined varieties, it is rare to find the indurated edema, the first three types being the ones usually associated, but the impression must not be gained that the multiplicity of types of chancre is nearly so common as the multiple chancre of a given type.

In the vagina, one of the first three forms may be present, but it is seldom that the patient's attention is attracted before the secondary stage has appeared. The chief exception to this rule is embraced in the clinical phenomenon of a persistent vaginal discharge which is thin and serous, and unlike the ordinary leukorrhea. This discharge is highly infectious. There is a rare form of primary syphilis which assumes the picture of a diffuse vaginitis, the discharge having the above character, but upon examination with the speculum nothing abnormal can be observed on the vaginal wall, excepting a generalized redness.

The vaginal portion of the cervix is sometimes the site of the primary lesion, but it is most common about the external os, along the edges of the cervical lips, the anterior one being more involved than the posterior. In type this particular form closely conforms to the Hunterian ulcer. Very rarely the vulvar, vaginal and cervical chancres appear together, but such combinations are among the greatest exceptions.

According to the stage of development of the chancre, the local glands are more or less definitely involved. In vulvar lesions the inguinal glands become palpable, are hard, discrete, painless, and suggest the arrangement of a chain of beads. They are invariably larger on the side corresponding to that of the lesion than on the opposite side, but when the lesion is in the mesial line, they are bilaterally equally enlarged. Less infrequently than is supposed the chancre is extragenital, and it may be situated on the perineum, in the groin, or on the mons. The extragenital lesions are usually of the Hunterian ulcerative type, or nodular. The chancre may be simulated by soft chancres, non-specific ulcers, flat condylomata, syphilitic papules, herpes and furuncles.

The soft chancre, as the name suggests, is softer than the hard chancre; it is movable, the walls are undermined, and a purulent

secretion is formed, but it must be remembered that there may be a double infection, and that a soft chancre, clinically, may actually be a combined non-syphilitic and syphilitic sore. In simple soft chancres the local glands are hard, acutely inflamed, larger, painful, and they fluctuate. In the combined variety, the diagnosis cannot be established without the aid of the dark field microscopic examination.

Non-specific ulcers of all varieties may simulate the hard hancre, but in general they are softer to the touch, and local adenopathies more closely resemble those connected with the soft chancre than the syphilitic chancre, and bacteriologic study will reveal organisms peculiar to the condition. Non-specific ulcerations at the sites peculiar to primary lesions are rare.

Flat condylomata are secondary syphilitic lesions caused by vegetation in the floors of mucous patches. The mucous patches themselves may resemble the primary erosion, or a superficial ulcerative chancre. Flat condylomata look like vegetating chancres. The condylomata are more likely to be multiple than are chancres, but the definite clinical differentiation between these two forms of early syphilis is frequently impossible, because very often the chancre persists after the beginning of the secondary stage, and it is a matter of no great practical consequence whether the differentiation between the two is made or not.

Syphilitic papules resemble the nodular primary lesion, and for the same reason that the flat condyloma cannot always be differentiated from the ulcerating chancre, the papule cannot be differentiated from the nodular chancre, nor would such a differentiation be of anything but academic importance.

Herpes progenitalis closely resembles multiple erosions. Save for the absence of induration no clinical differentiation can be made, excepting by the dark field. A point of practical importance is that very often simple herpes become the site at which the syphilitic infection is introduced. Thus women who give a history of frequent attacks of herpes may finally, through this clinical peculiarity, become susceptible to infection with the spirochete.

Furuncles may closely resemble indurative edema, and in this connection it may be added that abscesses of the Bartholinian glands may cause like confusion. In indurated edema there is, however, no fluctuation, nor is there any glandular inflammation suggestive of a suppurative process.

Primary lesions of the vaginal mucosa are likely to simulate only non-specific ulcers, or other specific or non-specific forms of general vaginitis. As to the first, no good clinical grounds for differentiation are known. Only dark field investigation for spirochetes can establish the diagnosis. As to the second, the character of the secretion is the only clue, however unreliable, and here again the diagnosis must finally depend upon the microscope.

Cervical chancres are simulated only by non-specific ulcers, than which they are harder. Their walls are steeper, and their secretion contains spirochetes.

In addition to its physical appearance, the diagnosis of the chancre rests upon certain general principles. In the first place, the older a chancre is the more likely there are to be signs of secondary syphilis, either systemic, or cutaneous, or glandular. Furthermore, the older a chancre is, the more likely is the blood to show the Wassermann reaction. Finally, and most important in primary syphilis, the spirochete is usually present and can be demonstrated by means of the dark field. In lesions of the vulva, however, usually before the physician has seen the patient, antiseptics have been applied, so that the dark field examination may be fruitless. Therefore, irrespective of what lesion exists on the vulva or in the vagina, or on the cervix, syphilis should not be excluded until repeated microscopic examinations have been negative. To facilitate the procedure, wet dressings of normal saline solution should be applied for twenty-four hours before the examination is undertaken, and no antiseptics should be used until a definite diagnosis is made.

Treatment of the Primary Lesion.—This is the treatment of syphilis in general. For the sake of local hygiene, dusting powders consisting of one part of calomel to one hundred parts of bismuth subnitrate, or some other mildly antiseptic powder,

should be applied several times a day, and for internal chancres, douches of 1 :3000, or 1 :4000 of bichlorid of mercury should be taken twice daily. The really important therapy, however, is systemic. In other words, as soon as the diagnosis is established, the patient should be treated with arsphenamine and mercury, just as though the secondary period were already fully developed, and the physician today who temporizes with syphilis is as much of a criminal as the criminal abortionist. The sooner the treatment is instituted the better, and although clinically the differentiation between primary and secondary syphilis is academic, as stated above, practically this is not true, for every moment of delay in instituting treatment is a distinct liability for the patient.

Secondary Syphilis.—Secondary syphilis is comparatively restricted in its local manifestations. There are four common types of lesions in this stage. These, with almost equal frequency, are the mucous patch, the flat condyloma, the papule, and the ulcerating papule. They are most common in the early secondary stage, but are capable of recurring either singly or multiply, both as to number and type. In general they are associated with other evidences of secondary syphilis, such as a generalized rash, headache, sore throat, or night pains, and the Wassermann reaction is always present. There are general glandular enlargements and usually the lesions secrete a malodorous, thin, sero-purulent fluid. Spirochetes are invariably present, and can be found by dark field examination, and obviously the lesions are quite as infectious as the primary ones.

The mucous patches are found on the mucous covering of the labia, the vagina, and the vaginal portion of the cervix. They are light grayish, superficial ulcers, varying in size from bare perceptibility to that of a lima bean, and are single or multiple. They are prone to be oval in contour, and their margins are not jagged. At times their surface is covered by a grayish-yellow fibrinous coating, but more frequently they are pink or red.

Flat condylomata are also single or multiple and are present on the mucous or cutaneous surfaces of the labia, singly or

multiply, and have a diameter up to three-quarters of an inch. They are fungating, gray or reddish gray, circular or flat lesions and their secretion is thin, watery, and swarms with spirochetes. What they actually represent are macerated papules and hence are closely related, if not indentical, with the third group of secondary lesions, namely, the papules themselves. These are usually situated on the outer surface of the greater labia, in the genito-crural fold, or perineum and about the anus. They are reddish, pink, or grayish in color, and in the main have the same attributes as the flat condylomas.

Ulcerating papules are simply a sub-variety of the last two types of lesions described, saucer-shaped ulcers having developed on the fungating surfaces of the lesions.

As already stated, these lesions are likely to be manifestations of the early secondary period, but any of them may recur from time to time during the months or years preceding the tertiary stage and they always, although tending to decrease in number, maintain to a large extent the general characteristics catalogued.

During the later epoch of the secondary stage they are not accompanied so regularly by the general manifestations of the secondary period, for tertianism is approaching, but the Wassermann reaction can almost invariably be elicited, and the spirochetes can always be demonstrated. This serves somewhat to differentiate them from the primary lesions in which the Wassermann reaction appears only as the secondary period approaches; and from gummata in which at times the Wassermann test is negative and in which spirochetes are rarely found, however closely the tertiary lesions resemble the secondary ones.

There are practically no other common diseases of the female genitalia simulated by secondary syphilis, excepting chancres and gummas, the differentiation of which has already been discussed.

Pemphigus vegetans closely resembles flat condylomata and moist papules, but the rarity of this disease would make a further discussion of the fact purely academic.

The treatment of secondary lesions is local and general. The local management consists in the use of dusting powders, as outlined above, douches, and possibly the employment of mercurial salves or suppositories, but here again the important thing is the proper systemic treatment, which consists of the conscientious, persistent, intelligent, and expert employment of arsphenamine and mercury over a period of years.

Tertiary Syphilis.—Tertiary lesions of the vulva are rare. They usually involve the larger labia, and are nodular or ulcerative in character, and tend to be serpiginous. They extend from their original point of development, fanwise, outward over the thigh, the mons or perineum, and are painless, unaccompanied by local adenopathies, rarely contain spirochetes, and are brownish or livid red in color. Lesions of this type may break down and become crusted, and although local treatment is of little avail, they sometimes heal spontaneously, and always respond to systemic treatment. As a rule, the Wassermann reaction is present, but spirochetes are difficult to find. When such lesions extend to the urethra or anus, the functions of these apertures are impaired, or rendered painful. Rarely the vagina and cervix are involved, and when this is the case, cancer of these organs is closely simulated. If, under such conditions, the Wassermann test should be negative, the differential diagnosis can be made only by means of a histologic examination, and here it must be emphasized that there is no law preventing a cancer developing in a syphilitic. Even though the serum test should indicate syphilis, if the lesion does not promptly respond to antisyphilitic therapy, a histological examination should be made. If malignancy is found, proper surgical treatment is indicated regardless of the Wassermann test.

Certain phases of syphilis of the genital organs that have not been mentioned must be alluded to. In the first place, it is possible that patients, once having had syphilis, since they can be promptly cured, may be reinfected. Secondly, although rare, it is possible for chancres to recur. Rarer still, chancres may develop in individuals with central nerve syphilis, for example, by means of a species of reinfection. The first of

these conditions is called reinfection; the second, chancre redux; the third, superinfection. In no practical sense does the chancre under these conditions differ from the type already described, either as to its future course, its infectiousness, the presence of spirochetes, or the future development of syphilis, save in the case of chancre redux, which is not so commonly followed by secondary manifestations as the other two varieties. The literature and present views on these conditions are not quite clear, but for the sake of completeness, it is necessary to mention the facts for what they are worth. While the details of the general management of syphilis have no particular place in a work of this character, the general principles involved are of paramount importance. The technical minutiæ are not precisely of gynecological interest, and the interested physician may satisfy his therapeutic requirements by the perusal of any of the standard modern books on dermatology or syphilis.

CONGENITAL SYPHILIS

By Walter J. Highman, M. D.

The gynecologist, in his relation to obstetrics, is not infrequently concerned with congenital syphilis, and is therefore entitled to a presentation of the modern views on congenital syphilis, in its general practical aspects. This subject is still clouded by numerous traditional superstitions and biases, which it would be well to correct. In the first place, congenital syphilis is erroneously known in the history of medicine as hereditary syphilis. Heredity is a distinct mechanism by which non-acquired biological attributes of ancestors are transmitted through chromosomes, and since species survive by means of a transmission of attributes that will enhance their prowess in the struggle for existence, it is evident that, in general, disease would be unlikely to be transmitted from one generation to another in this manner. Certain racial peculiarities, unfortunately, can thus be conveyed by the chromosomes which, in terms of practical medicine, means that predispositions to diseases can be inherited. But infections *per se* cannot be inherited, for the average disease germ is out of all proportion large to the total number of human chromosomes, and if it were possible for an ovum or spermatozoön itself to be infected, it would probably no longer be viable and could not generate. Therefore, both on biological and mechanical grounds, it is impossible to conceive of an infection of these two cellular elements necessary to procreation, and at the same time to imagine that they could carry out their peculiar creative function. This being the case, in a technical sense there can be no such thing as hereditary syphilis. On the other hand, the new-born can be afflicted with syphilis. Thus, some time between the instant of conception, and the instant of birth, the human embryo must become infected. Unquestionably, in

a restricted sense, even the word "congenital" is erroneous, for it implies something that occurs at the moment of birth, and we know that the fetus can be syphilitic long before this moment. So that it would be more in conformity with truth if we referred to congenital syphilis as syphilis acquired during intrauterine life in contradistinction to syphilis acquired after birth. In other words the term intrauterine syphilis would be the correct one. But for all practical purposes the term "congenital syphilis" is satisfactory because we are not cognizant of syphilis in a living baby until it is born.

It was formerly believed that a non-syphilitic baby born of a syphilitic mother was immune to syphilis, and likewise it was believed that a non-syphilitic mother giving birth to a syphilitic baby was similarly immune. These are the well-known laws of *Colles* and *Profeta*. These laws are obsolete. It is true, fortunately, that a syphilitic mother can produce a healthy child, and this is due to certain peculiarities of the disease which will be mentioned. But a syphilitic baby always indicates that the mother is syphilitic. Evidence of this is in the fact that the combined investigations of practically all observers throughout the world show that the mothers of syphilitic babies present the Wassermann reaction. This at once ends any debate as to the paternal transmission of syphilis, the mother remaining uninfected. A few sporadic efforts in recent years have been made to prove the reverse, but the arguments are so theoretical, and the actual antagonistic facts so unconvincing that the whole matter, at least at present, appears to be purely a scholastic controversy.

The only possible way by which it would be conceivable for the paternal transmission to be accomplished would be if the spirochete, independently but synchronously with the spermatozoön entered the ovum, or if the spirochete attached itself to the spermatozoön and were thus pulled into the ovum, so infecting the latter. Another conceivable possibility would be that resting forms of spirochetes (if there are such things) small enough to be conveyed into the ovum by the spermatozoön, would thus gain access. In the first and second hypothetical instances the ovum, being diseased, would not be viable. In

the second and third hypothetical instances, the spermatozoön being diseased, would not be viable. In any instance, that cell created by the fusion of the ovum and spermatozoön, if the fusion indeed could take place, would be diseased, so that the resultant entity would not be viable. It would seem that this is sufficient to constitute a perfect *reductio ad absurdum*, and the burden of proof is safely placed upon the paternists, where it belongs.

What actually happens is infinitely simpler. The mother is infected either before, or at, or after conception. By virtue of her lymph and blood invasion by spirochetes, the placenta is infected and acts as a huge primary focus, analogous to the chancre, from which the spirochetes travel through the umbilical vein into the fetal liver. Here the spirochetes increase in number and gain access through the portal circulation to the fetus. If the products of conception are infected before the portal circulation is established, they die immediately and are aborted. If the infection takes place shortly after the establishment of the portal circulation, the fetus is likely to die and be cast off, and the earlier after this moment that the fetus is infected, the greater likelihood for it to die and to be either aborted, miscarried, or prematurely delivered, according to the precise moment in its development at which death takes place. It is possible, however, for a woman to conceive and be pregnant, during a period of syphilitic latency, or for the spirochetes in a mother, even with tertiary syphilis, never to reach the placenta. In such an event the fetus will not become infected, and it is for this reason that frequently syphilitic mothers give birth to healthy children, and such children are in no wise immune to future syphilis. It is always possible at birth to determine whether the baby is then syphilitic or not, when it appears clinically free from the disease, by performing the Wassermann test on the placental blood. This is a practical procedure which obstetricians would do well to have carried out as a matter of routine, regardless of any sentimental considerations, precisely as they apply Credé's treatment to the eyes of all new-born infants, regardless of all evidence of the mother's having or not having gonorrhea.

The manifestations of congenital syphilis may be present at birth, or appear shortly after birth, or a few years after birth, or many years after birth. The last form is known as retarded congenital syphilis, or, according to *Fournier* who first described it, as *syphilis héredo-tardive*. These facts possibly are confusing if one considers intrauterine syphilis a peculiar disease as compared with the acquired disease. As a matter of fact, however, it is precisely like acquired syphilis. If a fetus is infected from six weeks to three months before birth, it will be born with secondary syphilis. If it is infected a week before birth, its secondary manifestations may appear six weeks or three months after birth, or exactly as in acquired syphilis. The secondary symptoms may never appear and tertiary symptoms may develop anywhere from three years to twenty-five years after the infection, or, the frank tertiary symptoms may not appear and the child, apparently healthy at birth, may, at six years become physically or mentally backward, or be imbecilic or insane; or, if not mentally deficient, may show some physical defects referable to the organic groundwork of a syphilitic infection of long standing. Nor need every child born of a syphilitic mother be syphilitic, for the reason already suggested, namely, that syphilitic mothers may bear healthy children during periods of latency or mild tertianism, whereas during active periods the offspring may be infected. The nearer to the secondary period that a woman bears her children, the more likely are the latter to be syphilitic.

For the sake of clearness it may be well to trace the manifestations of congenital syphilis, according to the month of fetal development in which fetal infection takes place, and it must here be stated that the fetus probably has biologic peculiarities that render its ability to cope with infection relatively slight. It must also be remembered that spirochetes vary in virulence. For these two reasons, up to a certain point, as already implied, a great many abortions, miscarriages and premature deliveries occur, in the last instance the feti being more likely to be still-born than not. Granted, however, that the offspring lives, if prematurely born it will either die shortly after birth, or lead a precarious existence of days or weeks, or even months, and

then succumb to its syphilitic handicap because of malnutrition or marasmus. Full term babies, otherwise healthy, may present evidence of the disease at the time of birth, or shortly thereafter. Such evidence consists of a macular eruption, or papular eruption, or bullous eruption of the hands or feet, according to the duration of the infection prior to birth, in a manner analogous to the peculiarities of the disease in its acquired form. In addition the baby will have a large liver and spleen, enlarged glands, and possibly snuffles, and any of these manifestations, or all of them, may develop anywhere between the moment of birth and six or eight months thereafter, according to the peculiarities of the individual infection. In one form of congenital syphilis in which the infant is alive up to the time of the confinement, and is still-born, autopsy discloses a syphilitic pneumonia, otherwise known as "white pneumonia."

If a syphilitic baby presents no signs of the disease within the first year or so, it is unlikely to present secondary syphilis at all, and here a peculiar biologic phenomenon must be explained. Neisser, several years ago, in connection with his investigations on the recurrence of gummas in acquired syphilis, reached the conclusion that the cells of a syphilitic throughout his body underwent a certain biologic alteration, so that if such an individual were cured and reinfected, this chancre would clinically resemble a gumma. He called this phenomenon *Umstimmung*, and it is closely related to allergy. In the same way that the syphilitic woman's body cells would present this phenomenon, so the offspring, composed entirely in their inception of such cells, would likewise present this phenomenon. This has nothing to do with the chromosomes; it is purely a matter of the humoral biology of the cell indicating that it has become so altered that in its response to the spirochete it has more of the quality of tertiary than secondary reaction. This being the case, the children of mothers whose syphilis is in a late stage respond to their spirochetes in a tertiary manner. Therefore, whether they develop syphilis two years or twenty-five years after birth, their response always has this tertiary quality, no matter whether the lesions are situated in the skin, the viscera, the bones, or the central nervous system.

It is impossible in a short chapter of this kind to describe in detail all of the manifestations of congenital syphilis, which are innumerable, but it will be sufficient to allude to them briefly, particularly with respect to their bearing on obstetrics. Actually this has been done already in describing the syphilitic baby at or near birth. However, it may be said in passing that after two or three years the child may develop a saddle nose because of syphilis of the bony architecture of this organ, or have disturbances of the long bones because of epiphyseal syphilis, or show central nervous abnormalities. Later on in childhood, particularly after the second dentition, Hutchinsonian teeth, keratitis, deafness, periostitis of the long bones and skull bones may develop, and finally in adolescence or in early adult life, the various manifestations of retarded congenital syphilis would arise, and these in no integral respect would differ from tertiary syphilis following extra-uterine infection.

The Wassermann reaction in congenital syphilis can be summarized in a few more or less arbitrary statements. It is always present in the mother. It is nearly always present in the placental blood of the child, if the child presents signs of the disease at birth, or is going to develop them within a year of birth. It becomes present in the retarded forms of the disease at the approach of activity. As already stated, the placental blood should always be tested for the Wassermann reaction, as a matter of routine, for the simple reason that the sooner the diagnosis is made in congenital syphilis, the better.

The treatment of congenital syphilis is a matter that would lead to a very lengthy dissertation. The general principles, however, are obvious. As soon as the diagnosis is made, treatment should be begun. Arsphenamine may be administered in doses up to a decigram, intravenously, into the jugular vein, and mercury should be administered by inunction, either by the employment of the ammoniated salt, or very small quantities, perhaps not over ten grains, of the gray ointment. Lack of space precludes more than these brief outlines, but these hints will suffice as a guide for the management of such cases.

SKIN DISEASES

By Walter J. Highman, M. D.

In their relation to gynecology dermatoses, although numerous, have a restricted anatomical significance. The sites involved would obviously be the vulva and adjacent regions, and perhaps the breast. It is neither with the idea of exhausting the field, nor of discussing therapeutic details that this chapter is included, but rather to indicate to the gynecologist how immediate dermatology is, in its bearing upon disturbances of the vulva. Irritations and inflammations, infections, atrophies and hypertrophies, and anomalies are the groups of causes which most commonly effect cutaneous changes at the sites in question.

Irritations and Inflammations of the Vulva.—Of this group of conditions, the commonest is dermatitis or eczema, either in acute, sub-acute or chronic forms. The symptoms are intense itching or burning, frequently augmented on urination, and the signs are redness, swelling and vesiculation in the acute and sub-acute types, and scaling in the chronic types. When vesiculation occurs the secondary phenomenon of crusting is found, so that the vulva appears edematous, red, crusted, and often excoriated. It is the cutaneous surface of the labia majora and the genito-crural fold and adjacent regions that are involved. The causes producing this picture are either general or local. The general causes are either diabetes or nephritis, and these conditions play a minor rôle. The local causes are mechanical, such as rubbing of the parts, or the presence of excessive moisture. A second group of local causes is more common, such as intolerance to antiseptics employed in douching, or the presence of an irritating discharge from the vagina. Finally, there is a group in which the cause cannot be determined, and in which it may be either local or general. If the process remains unchecked, and scratching is continuous, the integument thickens, creating a picture known as lichenification. This condition is characterized by a leathery quality

of the integument, which becomes inelastic, red, violaceous, or brownish in color, and deeply furrowed. The surface may be excoriated, or scaling, or both, and at times the underlying condition may arise as an acute exacerbation upon the chronic one.

The treatment for this condition consists, in the first place, in attempting to find the causative factor, and possibly eliminating it. The local treatment includes the use of mentholated dusting powders, calamine and zinc lotion, wet dressings, alkaline douches, and, above all, the proper employment of the x-rays in fractional doses, possibly one-quarter of a skin unit a week. Should diabetes be the underlying cause, a cure of the cutaneous disturbance almost invariably follows control of the sugar metabolism. At times, in fleshy women, an irritation resembling prickly heat and occurring in the artificial as well as the anatomic body folds develops. This is known as intertrigo. It is usually easily cured by the use of dusting powders, but sometimes an acute inflammatory process develops on this basis, and the management thereof conforms to that outlined above.

Rarer inflammatory conditions are pemphigus vulgaris, pemphigus vegetans, herpes gestationis, dermatitis herpetiformis, lichen planus, seborrhoea, and psoriasis. Other evidences of all of these diseases are ordinarily to be found elsewhere on the body, and to go into a detailed description would be unwarranted, considering the infrequency with which gynecologists either encounter or treat the diseases in question.

Infections of the Vulva and Adjacent Areas.—Infections of the vulva may be caused by animal parasites, bacteria and fungi.

Of the animal parasites scabies and pediculosis pubis are the only ones of practical significance. In scabies the burrows may be seen, as well as other evidence of the disease elsewhere on the body, and sometimes a secondary dermatitis arises. In pediculosis pubis both the parasites and ova are found. In both of these conditions a cure may be practically assured by the use once daily of a 10 per cent. balsam of Peru ointment. In pediculosis, however, the quickest results are obtained by shaving.

Bacterial infections may be specific or non-specific. Eliminating the gonococcus, which causes practically no cutaneous changes, the specific organisms provoking lesions at the sites in question are tubercle and lepra bacilli. They rarely cause changes here, however, and need be mentioned only to be dismissed. One important lesion caused by a specific organism is the soft chancre, or chancroid, probably provoked by a strepto-bacillus, first described by Ducrey. The lesion starts within a day or two after exposure as a sore, red spot, which rapidly breaks down into a soft ulcer, the edges of which are jagged and undermined, and the floor flat. The lesion is painful and secretes a yellowish pus. It grows gradually in size, and daughter ulcers develop in its neighborhood. By confluence these may unite. It runs its course in a month or two, and it occurs chiefly near the urethra, on the clitoris and labia. It rarely occurs on the mons, near the anus, on the cervix. It is associated usually with a suppurative inguinal adenitis. The ulcer is best treated by the application several times a day of peroxide of hydrogen, followed by dusting powders, and by the liberal use of soap and water. Strong caustics are to be avoided. The suppurative adenitis requires surgical treatment.

The only important non-specific bacteria to consider are staphylococci and streptococci. Staphylococci may cause a secondary infection of any of the dermatoses in the first group mentioned. More commonly, however, they inflame the hair follicles, producing a picture either of suppurative folliculitis, or furunculosis. In the former condition each hair follicle is the site of a pustule pierced by a hair, and the lesions themselves are minute, varying in size from a pinhead to a pea, and in number, from very few to a great many. Furuncles present the characteristics of this disease anywhere on the body. The treatment of folliculitis consists in the use of wet dressings, or a 2 per cent. solution of salicylic acid in alcohol, sponged on two or three times a day, to be followed by a dusting powder of bismuth subnitrate or talcum in which some mild antiseptic, such as boric acid, has been incorporated. The x-rays are of great service in this condition, employed in the manner already

described. Furuncles must be treated surgically and by vaccines. Polyvalent stock staphylococcus vaccines are the best.

The most common streptococcus lesion is that of impetigo contagiosa. It appears in the form of superficial, pink, crusted ulcers which may be circular or festooned in outline, and single or numerous. It arises as a secondary phenomenon upon any itching disease, principally scabies, and is usually easily cured by soap and water used twice daily and followed by a 2 to 10 per cent. cream of ammoniated mercury. Erysipelas at these sites is rare and requires the same treatment as elsewhere.

Fungus infections are uncommon in women. Among them are erythrasma, which is a brown placque-shaped lesion in the genito-crural fold, often extensive enough to involve the perineum and buttocks. It is caused by the microsporon minutisimum. Another condition resembling vesicular ring-worm is inguinal epidermophytosis. Both of these conditions are amenable to the following salve:

℞. Acidi salicylici..... 6.0
Acidi benzoici..... 12.0
Cold cream, qs. ad..... 100.0

This cream is to be rubbed in vigorously twice a day. If it should irritate the skin, as it may occasionally, an emolient ointment, such as the U.S.P. zinc oxid, may be employed to soothe the inflammation. Other fungus diseases are too rare to require mentioning. They are the ordinary forms of ringworm, blastomycosis and sporotrichosis.

Atrophies and Hypertrophies of the Vulva.—The conditions included in this group are rare. The only atrophy that occurs is kraurosis of the vulva. This condition is seen in old women, and is actually a scleroderma of the larger labia. A shrinking and hardening of the integument are produced with the obvious mechanical disturbances that would ensue. There is no cure.

The only hypertrophy of any significance is elephantiasis of the vulva, one form of which is due to filariasis, the other form being due to lymph stasis, secondary to chronic dermatitis or eczema. The clinical manifestations of the condition are swelling, without redness, of either labium, or both of them,

and the proportions reached may be enormous. In that form which is secondary to dermatitis, sometimes minute lymph cysts develop on the surface of the lesion. At times these cysts break down causing ulceration, and this picture may furnish one variety of a rare disease known as esthiomène.

Very little is known about this unusual malady, although much has been written concerning it. In its commonest form it is an ulcer, the nature of which is not known, and which terminates in an atrophy of the parts affected. Ordinarily, it is some part of the vulva, perineum or anus, or a combination of the three, that are included. There is no satisfactory treatment for the condition.

Anomalies and New Growths.—These are infrequent. Moles are sometimes seen. These require no treatment, unless they are of the cavernous angiomatous variety, and then only if they are a mechanical annoyance. All neoplasms are rare and require no treatment, unless they are voluminous or malignant in which event surgery or radium offer the proper therapeutic relief.

Irritations and Inflammations of the Breast.—The breast participates in all general dermatoses. Dermatitis, eczema, and intertrigo develop on this organ, as elsewhere on the body, and present the same clinical pictures and therapeutic indications already described above. Only one important point need be discussed, namely, the tendency for fissures to form on the nipple and areola in the case of chronic inflammatory processes. Topical applications of a 30 per cent. solution of silver nitrate, and applications of Lassar's paste are the best means of treating these fissures. The x-rays are also useful.

Infections of the Breast.—These are in the same group as those mentioned above, and it must be remembered that in women two of the favorite sites of inflammation in scabies are the areola and the under surface of the breast. The treatment has already been described.

Atrophies, Hypertrophies, Anomalies and Neoplasms of the Breast.—Hypertrophies and atrophies play a minor rôle as to this organ, as do also anomalies and benign neoplasms. Unfortunately, however, the breast is one of the commonest sites for

malignancy. It is unnecessary to discuss mammary carcinoma at this point, for this disease is a purely surgical condition. One of the phases of malignancy, however, must be referred to, even if briefly, and this is Paget's disease of the nipple. This condition is rare. It occurs from the late thirties onward, is usually characterized by unilateral involvement, and clinically the condition resembles a weeping eczema about the nipple and on the areola. On palpation a mass is felt in the breast, and on histological examination the presence of cancer is ascertained, a great many of the cells at the site of the cutaneous involvement having undergone a peculiarly characteristic vacuolization. The treatment for the condition is the removal of the affected breast, and the glands, followed by x-ray treatment of the scar, precisely as in any other form of mammary malignancy.

Furunculosis vulvæ is a condition not infrequently met with, especially in older women. A furuncle appears as a small, hard, nodular swelling, which is red and painful. It becomes larger, sometimes extending superficially and forming a pus-nodule; at other times spreading deeply and producing a phlegmon, with quite extensive infiltration of the connective tissue of the large labium. New nodules form as the old ones heal or are treated, and the condition may spread or extend and last for weeks. It is often unilateral.

The Treatment of Furunculosis.—Small unripe furuncles should be touched with pure carbolic acid and then thoroughly painted with several coats of iodin. This may prevent their further extension and development. If a furuncle goes on to the formation of purulent accumulation, it should be incised and touched with either pure carbolic acid followed by iodin or with a 40 per cent. solution of carbolic acid in alcohol. When furuncles, instead of developing superficially, extend deeply into the connective tissue and form a phlegmon, abortive treatment is advisable. Very hot sitz-baths of a duration of twenty minutes should be taken. Moist applications of gauze, saturated in a strong hot solution of acetate of aluminum, should be applied constantly and frequently changed. If this treatment does not suffice to prevent the extension or the breaking down of the phlegmon, incision and surgical treatment are necessary. To prevent the extension and continuation of this condition, internal medication should be tried in the form of calx sulphurata or compound syrup of hypophosphites. One half a cake of yeast, either active or killed, taken three times a day in fruit juice, helps in many cases. The urine should always be examined for sugar.

Vulvitis.—The term vulvitis is applied to affections of the skin, of the mucous membrane, or of the glands of the vulva. The term vulvitis is often used to describe conditions involving simply the skin area of the vulva, which strictly do not constitute a vulvitis, but belong rather to the category of pruritus vulvæ.

Lack of cleanliness, especially in older women with lacerated perineum, with resulting mild vaginitis, may involve the skin area of the vulva. Like causes produce skin irritation, such as intertrigo, which occurs in fat persons, especially in the summertime. There is, in addition, a dermatitis which may spread from the inner surface of the thighs and involve the vulva. It also occurs often in fat persons. Such conditions, due to uncleanliness, to contact of the parts, etc., are accentuated by scratching. There may also be conditions of the same character as affect the skin in other parts of the body, such as acne or herpes, eczema, various parasitic conditions. Herpes vulvæ is especially observed in pregnant and fat women. It is characterized by groups of small vesicles whose appearance is preceded by pain. They generally disappear in the course of a week or ten days.

Onanie as a Cause of Vulvitis.—There may be a lengthening of the small labia and the clitoris, a condition to which Dickinson has called attention, but this is not always present. The sebaceous glands on the inner surface of the small labia and on the vestibule are increased in size, so that the inner surface becomes uneven and looks as if it were covered with file-like elevations. There is often an increased discharge of mucus from the glands of Bartholin, and huge amounts from the cervix. At times the vulva has a very red, congested look.

An acute inflammatory vulvitis, really constituting a vulvovaginitis, occurs in children as a diphtheritic inflammation in diphtheria, and more frequently as an eruptive, ulcerative, or necrotic condition in the infectious diseases of children, such as scarlatina, measles, etc. A gonorrheal vulvitis in children is by no means infrequent, producing, in addition to burning and itching, few annoying symptoms. It is only part of a gonorrheal vulvovaginitis. A real vulvitis occurs in adults as a result of, or in combination with, inflammations of the urethra, of the vagina, of the cervix, usually gonorrheal. In addition, the vulva may undergo marked chemical or bacterial irritation from the secretions of a degenerating or necrotic carcinoma or myoma of the cervix or uterus, or from the urine associated with a cystitis or discharged from a fistula.

A catarrhal vulvitis is an inflammatory affection of the mucous membrane on the inner surface of the labia majora and the labia minora, on the clitoris, and in the vestibule up to the hymen. With it are often combined inflammations of the urethra, of the ducts of Bartholin, of Skene's glands, *i. e.*, of the mucous membrane canals which open into the vestibule. In acute infectious cases the diagnosis is made by inspection. The labia majora and minora are swollen. Touching the parts causes contraction of the constrictor cunni or vaginismus. The mucous membrane is diffusely red, especially at the introitus. The mucous membrane bleeds readily on mechanical irritation. In acute cases the secretion is purulent and mixed with the tenacious mucus of the glands of Bartholin. Purulent discharge from the urethra, punctate redness of the vulva, involvement of the glands of Bartholin, involvement of the periurethral glands, small red hypertrophies of the mucous membrane, speak clearly for the existence of a gonorrheal cause. With inflammations of the vulva ulcerations may occur. They are situated especially in the fossa navicularis, at the edge of the hymen, and in the circumference of the external meatus of the urethra.

In chronic vulvitis there is little or no discharge. There are only masses of squamous epithelium. Sometimes a milky or purulent secretion can be expressed from the recesses and folds of the vulvar mucosa. In other chronic cases the mucous membrane is not so red, but evidences red spots and streaks at the border of the hymen, about the urethral orifice, on the outer surface of the hymen, and about the ducts of Bartholin. In still other cases there is little visible change resulting. Little remains of the original condition except evidences of the scratching, due to the itching.

Vulvitis pruriginosa is often classed as a form of pruritus vulvæ. Pruritus vulvæ is generally a secondary condition and attention must be paid to the cause. Among the causes are icterus, diabetes, irritating discharge from the vagina, cervix, or uterus, masturbation and endometritis with irritating fluor, and, in addition, the irritation of ammoniacal or pathologic urine. But there occurs in older women, at the climacterium, a condition which is really a chronic inflammation without any

evident cause. Vulvitis pruriginosa is such a chronic inflammation of the vulvar mucosa in older women, with marked symptom of burning and itching. The mucous membrane and the surrounding skin are markedly inelastic and furrowed into folds, especially about the clitoris. It has a bluish-gray color, sometimes very pale, in contrast to the surrounding mucous membrane. The main symptoms are burning and itching, which are aggravated at night in bed. Scratching can scarcely be resisted, and there result excoriations and eczematous conditions. This form is not infrequently one-sided. It is to be distinguished from kraurosis vulvæ.

Kraurosis Vulvæ.—This is an atrophic condition of the corium of the mucous membrane of the larger and the smaller labia and of the introitus. There first appear white spots on the surface of the mucous membrane, which later take on a sclerotic character. The mucous membrane becomes white, grayish, and atrophic; gradually the smaller labia and the clitoris shrink. The larger labia appear flat and the smaller labia seem almost absent. The clitoris is small and lies concealed under folds of atrophic mucous membrane. Pruritus is the only subjective symptom. Narrowing of the introitus results. It differs from vulvitis pruriginosa in two important respects: (1) There is a decided narrowing of the introitus; (2) the atrophic condition of the skin is marked. This is in contrast to the inelasticity and folded character of the skin in vulvitis pruriginosa.

Diabetic Vulvitis.—This condition, which occurs in connection with diabetes and is characterized by intense itching, is, as a rule, so typical in appearance that the diagnosis can be readily made. The entire skin covering of the larger labia and the smaller labia, the clitoris, and the vulva have a bronze or copper-colored leathery look and feel. These tissues are thickened but do not pit on pressure and they are elastic in character. Occasionally the condition is one of furunculosis. In every case of vulvitis the urine should be examined for sugar.

THE TREATMENT OF VULVITIS

In the treatment of catarrhal vulvitis the usually associated urethritis and vaginitis, etc., should be treated. For the

vulvitis itself, local applications of dilute solution of lead subacetate, or a solution of acetate of aluminum, give relief. After the acuteness is over, local painting with 5 to 20 per cent. solution of nitrate of silver or the application of a 5 per cent. cocain salve is advisable. Cases beginning as intertrigo in fat women should be treated by a thorough washing with soap, followed by a 1:5000 oxycyanide of mercury solution; then salve should be applied, either zinc ointment or 10 per cent. bismuth subnitrate in oxid of zinc, or the area should be painted with 10 per cent. silver. It is comforting to dust the adjacent skin areas with stearate of zinc powder.

When inflammatory vulvitis is first seen, the vulva should be thoroughly washed with glycerin soap and water, making use of cotton sponges. The treatment of vulvitis demands absolute cleanliness and the correction of the cause. If it is secondary to conditions existing in the urethra, bladder, vagina, cervix, or uterus, these affections must be treated. In addition to the preliminary washing, the vulvitis itself is benefited markedly by warm sitz-baths taken twice daily for periods of fifteen minutes. Shaving of the hairy parts of the skin area involved is of great value. Twice daily douches should be taken, consisting of 1 dram of acetate of aluminum to 2 quarts of water.

Acute gonorrheal vulvitis should be treated by cleansing of the external structures. Mild solutions of oxycyanid of mercury or tincture of iodin should be used. The parts should be carefully separated and gently sponged with cotton soaked in the solution, each washing being followed by a vaginal douche of oxycyanid of mercury 1:5000. Bichlorid gauze should then be placed in such a manner that the two sides of the vulva can be kept apart by a T binder gently applied. The patient should be kept in bed and sedatives administered four times a day. If the skin is sensitive and red and is irritated by the action of the mercury, the gauze dressing should be saturated with a solution of acetate of aluminum. In the subacute stage the vulva may be treated by the silver salts. It can be painted with argyrol 25 per cent., or nitrate of silver

10 per cent., and the surfaces should be kept dry by gauze dusted with aristol or nosophen.

Some of the cases are benefited if the two halves of the vulva are kept apart by gauze saturated with a 1 per cent. solution of acetate of aluminum. In other cases relief is obtained by saturating the gauze with a dilute solution of acetate of lead or a watery solution of 1 to 5 per cent. carbolic. When the acute stage is over, the solution should be changed to 1 per cent. alum and the vulva should be painted with 5 to 10 per cent. nitrate of silver.

In the treatment of chronic vulvitis attention should be paid to the area immediately around the external opening of the urethra. Any resisting inflammation about the urethra or a folliculitis of the same area must be treated by the actual cautery or by the nitrate of silver stick, preceded by the use of cocain.

Some of the cases do well on the application of salves. A 10 per cent. ointment of bismuth subnitrate in a base of oxid of zinc or a 2 per cent. carbolic ointment is of value. Salves include a 10 per cent. calomel ointment; 5 to 10 per cent. cocain salve (cocain, 1 dram; lanolin, 1 ounce; olive oil, 2 drams) or menthol ointment (menthol, ½ dram; olive oil, 2 drams; lanolin, 1 ounce); a carbolic ointment, containing 15 grains of carbolic acid to 1 ounce of unguentum zinci oxidi; a 10 per cent. ointment of anesthesin. If this does not give relief, the parts should be kept dry by dusting powders. In mild cases a powder composed of equal parts of oxid of zinc and starch is sufficient. A better powder is one containing 20 grains of salicylic acid to a half ounce each of oxid of zinc and starch. A very good powder consists of menthol 15 grains, salicylic acid 1 dram, oxid of zinc 2 drams, amylum and talcum 5 drams. In the more stubborn cases the vulva must be painted with 10 to 20 per cent. solution of nitrate of silver.

The treatment of vulvitis pruriginosa, of kraurosis vulvæ, of diabetic vulvitis, and of the skin annoyances is given in the section on Pruritus Vulvæ.

COLPITIS OR VAGINITIS

Etiology.—Newly born children by no means rarely acquire gonorrheal vulvovaginitis of various degrees of severity. Older children quite frequently suffer from gonorrheal vulvovaginitis. This condition is generally considered to be simply a vulvitis, when in practically every case, especially those which do not yield very quickly to treatment, the associated vaginitis is the important condition.

Diphtheria rarely, but much more frequently measles and scarlatina, may produce an acute involvement in the vagina of an eruptive, ulcerative, or hemorrhagic character, which is often unrecognized; and when noted, because of the bleeding, considered to be a precocious menstruation.

In adults acute structural primary involvement of the vagina by the frequently inoculated gonococcus is not so easy. The thick squamous epithelium is much more resistant to the gonococcus than in children, with their tender, thin, vaginal epithelium, yet this involvement may take place primarily. Vaginitis is frequently secondary to involvements of the cervix and uterus by gonorrhea and catarrhal inflammations. Of course, all infecting bacteria must pass through the vagina before reaching the cervix and uterus, where they find a more favorable soil. In the vagina there is a concomitant element of continued irritation. A secretion from the cervix and uterus, produced by any cause, such as gonorrheal or other infection, or by degenerating carcinoma or myoma, is constantly poured into the vagina, macerates the vaginal epithelium, and produces mechanical and chemical irritation and subsequent inflammation.

Contributing Causes of Colpitis or Vaginitis.—The use of unclean pessaries, the presence of neglected tampons, injury to the vaginal mucosa from the pressure of pessaries, etc., may permit introduced bacteria or the various forms of bacteria

present in the vagina to add the element of inflammation to that of mechanical irritation.

Infection of the vagina from the rectum by the bacterium coli or by saprophytes may occur in older women with lacerated perineums and non-resistant tissues. Prolapse of the vagina or cystocele in older women permits of irritation of the exposed vaginal mucous membrane, in addition to the natural tendency to senile vaginitis in that period.

Vaginitis or colpitis is a catarrhal inflammation of the mucous lining of the vagina from the hymen up to the external os. Colpitis must be distinguished from hypersecretion.

Hypersecretion occurs in pregnancy and with inflammations, exudates, and tumors situated near the vagina. It may also occur with chlorosis, with anemia, with the irritation of intercourse, and with onanie. Such secretion is pure white. All purely white secretions contain squamous epithelia. Serous discharge may come from the vagina. A milky serous secretion is characteristic of the vagina as a result of the serum which is thrown off from the capillaries of the papillæ. Such a secretion results from an increased throwing off of squamous epithelium which forms white masses often accumulated on the surface of the mucosa as thick white particles. When these are removed, the character of the mucosa underneath is seen.

Acute Colpitis.—Colpitis is recognized with the aid of the Ferguson speculum: (1) By the character of the vaginal secretion, (2) by changes in the mucous membrane. With acute infections there is a production of pus and the secretion takes on a tinge of yellow. The more acute the process, the more yellow and more purulent is the discharge. Pus is more profuse in the granular colpitis of gonorrheal origin, especially in pregnancy. Purulent secretion is not characteristic of the vagina alone, but may come from the uterus. The appearance of the vagina, however, generally shows whether it is involved. Whenever there is doubt as to the source of the purulent secretion, a long vaginal cotton-gauze tampon should be used (Fig. 64). In colpitis the tampon becomes soaked with discharge and that part of the tampon which is in contact with the vagina is covered with pus. In the punctate form of colpitis

the tampon shows a yellow spot corresponding to every involved point.

In acute cases the mucous membrane is diffusely red. There is also, in addition to the diffuse redness, a spotted or streaky hyperemia, due to a marked injection of the papillary bodies of the mucous membrane. In the upper part of the vagina, there are red, ink-like spots, or red streaks, which represent the summit of the vaginal folds. The spots bleed easily and sometimes ecchymoses are present. With intensive inflammation the papillary bodies of the vaginal mucosa swell and the vaginal folds and papillæ project above the surface of the mucosa. This is especially marked in the gonorrhea of pregnancy, and there results what is called a colpitis granularis.

In secondary colpitis, resulting from an infectious cervico-uterine catarrh, the discoloration of the vagina is most marked or often limited to the posterior wall of the vagina near the external os.

Chronic Vaginitis.—If chronic hypertrophic conditions supervene in the inflamed papillæ, there may result condylomata acuminata, which are small excrescences with a white irregular surface that occur singly in the vagina or on the portio. In the mild or chronic forms of colpitis there may be varying degrees of milky or serous discharge. When this is removed, the red mucosa is seen underneath. In the mild or chronic forms of colpitis tiny red spots may be the only signs observed.

Senile Vaginitis.—Spots and ecchymoses are most distinct in senile women, because of the thinned-out character of the vaginal squamous epithelium. Vaginitis senilis occurs frequently at the climacteric period and represents regressive changes in the mucous membrane, which becomes non-resistant to vaginal bacteria. There may be a diffuse redness of the mucosa, which is especially marked in the exposed mucosa if cystocele is present. There may, on the other hand, be erosion of the surface. The papillæ are not prominent. There may result adhesions of the upper and lower vaginal walls or even atresia of the entire canal. These adhesions yield readily to pressure and are followed by a little bleeding.

Colpitis Mycotica.—This condition may occur, especially in pregnancy, and is due to the leptothrix vaginalis or to the oïdium albicans. The latter may cause an appearance simulating colpitis with epithelial desquamation. It occurs most frequently in pregnancy and forms white spots, generally at the summit of the vaginal folds. These are not easily wiped off, and when removed uncover red inflamed areas which bleed readily. Microscopic examination in diluted potassium hydroxid solution sometimes shows only squamous epithelium, but often reveals the mycelium oïdium albicans.

Colpitis Emphysematosa.—In pregnancy especially there may occur the formation of gas vesicles in the mucosa, generally situated on the posterior wall, due to the activity of gas-producing bacteria and called colpitis emphysematosa.

In colpitis there may occasionally occur an exfoliation of part of the mucous membrane. This happens, as a rule, after the application of drugs, such as several coats of iodin. Microscopic examination distinguishes this membrane from intrauterine exfoliations, with which it may be confused.

DIAGNOSIS

The symptoms of an acute colpitis are local heat, a sensation of burning, and pressure. Coitus is painful. There is usually an associated vulvitis which causes burning with intertrigo. In the acute cases these symptoms are generally disregarded because of the severity of the associated external or higher infections. In children the symptoms are those of vulvitis. Even in gonorrheal vulvitis, with the exception of some burning and irritation, the annoyance felt by the patients is very slight.

In colpitis the examining finger may feel the rough character of the vagina, due to the projections on the transverse folds of the vagina. When infiltration takes place on the transverse folds or in the papillæ, the vagina feels like a file to the examining finger. When there is diffuse redness, the vagina may feel as smooth as moss. In other cases the finger simply notes the heat of inflammation. In the mild forms of colpitis, associated with epithelial desquamation, the examining finger notes the

dried particles which cover the entire vaginal mucosa. Often the finger notes nothing, especially in the senile vaginitis, because in them the papillæ are not prominent. The symptom of chronic colpitis is simply fluor albus. Senile vaginitis, which is often combined with cystocele, results in itching and burning and some bleeding on examination or on the use of rings. The diagnosis of colpitis is made by inspection, by palpation, and by the microscope.

TREATMENT OF VAGINITIS

The vaginitis associated with acute infectious diseases should be treated by daily douches of 1 per cent. carbolic acid or a 1:1000 solution of acriflavine.

In acute vaginitis the patient should have rest in bed, the external genitalia should be thoroughly cleansed, and tepid sitz-baths should be taken daily. Alternate tepid douches of oxycyanid of mercury, 1:5000, and acetate of aluminum, 1 dram to 2 quarts, should be given four times daily, and gauze soaked in 1:5000 oxycyanid or in 1 per cent. acetate of aluminum should be applied to the perineum and vulva. If the irritation is marked and if the treatment of the vaginitis demands sedative and antiseptic douches, thymol 1:1000, permanganate of potash 1:1000, and ½ per cent. ichthyol can be substituted for the mercury. In addition to the above solutions, acetate of lead is of value in the strength of 1 to 2 per cent., or Lugol's solution 1 to 2 drams to the quart, or pyroligneous acid 1 to 4 drams to the quart. Internally bromids should be administered. When the primary inflammation and sensitiveness is diminished, hot douches of oxycyanid of mercury, or 1 to 2 per cent. carbolic acid are of value. In the case of sensitive vagina, ointments containing carbolic acid 1 per cent. or ichthyol 5 per cent. may be used at first. If the vagina is not too sensitive, it should be washed with the aid of a Ferguson speculum with sponges soaked in a carbolic solution, and gauze soaked in 1 to 5 per cent. protargol should be introduced into the canal and left in place for several hours. Still later the vagina is bathed, with the aid of a Ferguson speculum, by solutions of nitrate of silver 1 per cent., and the vagina should

be gently packed with sterile gauze or iodoform gauze left in place for twenty-four hours. Then irrigate daily with alum 2 per cent. or permanganate of potash 1:3500. In the chronic persisting forms of vaginitis the Ferguson speculum is used and nitrate of silver applied in stronger solutions.

In very chronic cases if silver, 1 per cent. or stronger, fails, paint the vagina every two or three days with tincture of iodin or silver 5 to 10 per cent., pack the vagina with gauze, and continue the treatment until the vaginal epithelium desquamates. Hot douches should then consist of tannic acid, sulphate of zinc, or alum, 1 dram to the quart. Splendid results are to be had by bathing the vagina, with the aid of the Ferguson speculum, with bichlorid of mercury 1:100, rendered acid by a few drops of hydrochloric acid. Then pack with iodoform gauze or gauze dusted with dermatol, and repeat twice a week. In the meantime irrigate with 1:5000 oxycyanid or with tannic acid, sulphate of zinc, or alum. This treatment is effective in hypersecretion, especially if associated with endocervicitis and fibrosis uteri. Nitrate of silver solutions exert an astringent influence when applied with the aid of the Ferguson speculum. Iron and tonics should be given for anemia. Pelvic congestion can be relieved by sitz-baths and the uterus should be supported by intravaginal pressure-therapy, and later on by a pessary. (See pages 130, 138, 139, 149, and the sections on Leukorrhea and on Gonorrhea.)

In that chronic form known as colpitis granulosa, first clean the vagina with the aid of the Ferguson speculum and then use pyroligneous acid through the Ferguson speculum, rubbing it well into the vaginal mucosa with cotton on a swab. This should be done two or three times a week.

Senile Vaginitis.—Bathe the vaginal walls thoroughly with pyroligneous acid three times a week for several weeks through the Ferguson speculum. Daily douches of pyroligneous acid, 1 to 3 drams to the quart, are to be ordered. No pessary is to be worn.

For colpitis mycotica 1 per cent. corrosive sublimate or three per cent. carbolic should be applied with the aid of the Ferguson speculum.

ENDOCERVICITIS OR CERVICAL CATARRH

Etiology.—An inflammation in the genital tract may be produced by tubercle bacilli which may reach this focus of localization through the medium of the circulation. The tubercle bacillus, as a rule, however, enters the genital tract subsequent to its presence in the peritoneal cavity, being then attracted by the ciliated epithelium into the tubes or uterus. Appendicitis with its exciting streptococci, staphylococci, or bacterium coli may, as a consequence of the resulting peritoneal exudation, likewise send its bacteria or cocci into the follicles of the ovary, or else into the tubes and uterus, through the action of the ciliated epithelium in their lining. The diseases of children, such as measles, scarlatina, mumps, etc., are known to produce, not so very rarely, unrecognized inflammation in the ovaries, tubes, or uterus, with resulting temporary or permanent structural and functional involvement of these organs. Scarlatina, diphtheria, measles, etc., may produce acute invasions of the uterus or necrotic lesion in the cervix or vagina with resulting annoyances in the way of stenosis and atresia. With these exceptions the bacteria which produce infection of the genital tract must first pass through the cervix. It is therefore of importance to study the cervix and its infections, and in addition to note the various lesions which may follow as sequelæ from this primary point of involvement.

Infection of the cervix in labor, in abortion, or in operations on the cervix and uterus may lead to various inflammations, such as endocervicitis, endometritis, metritis, salpingitis, oöphoritis, peritonitis, true septicemia, pyemia, phlebitis, and local involvement of the cellular connective tissue of the pelvis. Frequently we find an exudative or purulent involvement of one or both broad ligaments, due to infection through lateral tears of the cervix, or else we find an inflammatory accumulation in the posterior parametrium or in the uterosacral ligaments. Any or all of these conditions may be due to infection during labor, abortion, or operations on the cervix, and are of not

infrequent occurrence. It must be remembered that previously present or introduced streptococci and staphylococci, or sometimes the bacterium coli, are frequently the agents which produce those pathologic conditions as well as the localized abscess formations in the cellular connective tissue. When the inflammation subsides, with or without operation, these infecting cocci and bacteria have a tendency to disappear, although they may continue in the uterus and cervix and though structural alterations may remain. If, as so often happens, the gonococcus be present before labor, abortion, or operation, it may then produce or take part in any of the above-mentioned affections, but the gonococcus does not subsequently disappear so quickly. Conditions which produce congestion in the genital tract seem to favor the continuance of the growth of bacteria. For instance, the gonococci may be found by careful examination after menstruation in the secretion of the cervix and uterus, although not found at other times. Excessive coitus may keep up or stimulate any of the inflammations present in the genital tract. Exertion, work, and lifting have the same influence. In gonorrhea, especially in the older cases, the staphylococcus is often partly responsible for the persistence of the chronic lesions. In such instances the gonococcus may disappear, at least so far as microscopic evidences are concerned. It is well known that in pyosalpinx after a certain period the gonococci disappear, and either streptococci or staphylococci are found or else the pus is sterile. That the cervix then may contain various forms of bacteria, or that they may enter the cervix from the vagina in abortions, labors, operations, etc., is certainly true in many cases.

Disregarding the affections that occur under the conditions of labor, abortion, or operations, and considering only the acute, subacute, or chronic involvements of the cervix under other circumstances, we are forced to the conclusion that the latter involvements are due in the vast majority of cases to the presence and development of the gonococcus.

In the female various forms of bacteria are present in the vulva. In the urethra streptococci, staphylococci, and bacterium coli are frequently present and may be introduced into the

genital tract. The normal vaginal secretion has an acid reaction and contains epithelial cells, various forms of bacilli, and yeasts and cocci. The normal vaginal secretion and the normal resistance of the squamous epithelium are, as a rule impervious to the invasion of various micro-organisms introduced from the vulva or by coitus or by examination. This resistance varies in different individuals and in different periods of life. A pathologic secretion contains leukocytes in addition to the squamous epithelia and various forms of bacteria, among which may be streptococci and staphylococci and gonococci. In older women and in senile women bacteria and cocci other than the usual ones may be present in the vagina and also in the cervix and uterus. When once the genital tract is the seat of a gonorrheal infection, however, the various pathogenic organisms which are usually destroyed when introduced into the vagina find opportunity for existence not alone in the vagina but also in the cervix and possibly in the uterus. Normally the upper part of the cervix and the uterus contain no bacteria, but when gonorrhea has once invaded the cervix and uterus conditions are altered.

Infections of the cervix very frequently occur in nulliparæ under circumstances not related to labor, abortion, or operation. The cocci and other micro-organisms which usually enter the vagina through lack of cleanliness or through coitus are destroyed in the vagina. When, however, through the male urethra, a pathologic seminal or prostatic secretion is continually being deposited in the fornices, the ability of the vagina to rid itself of micro-organisms is not absolute, nor can it protect the cervix and its lining. The pathologic seminal or prostatic secretion may contain gonococci or streptococci or staphylococci, and in very rare instances tubercle bacilli. A chronic prostatitis originally gonorrheal may be complicated by the presence of pyogenic cocci, complicating the original disease either as a mixed infection or as a secondary infection. That some cases of cervical involvement may thus result from streptococci or staphylococci, is quite probable. While the gonococcus may play an important rôle in the production of mucous membrane, subepithelial, peritoneal, and systemic

acute involvements, with or without relation to pregnancy and the puerperium, it more often plays a generally unrecognized rôle in the production of chronic, stubborn, or permanent affections of the mucous membranes, the myometrium, the peritoneum, or the pelvic cellular connective tissue. The point of primary infection in these conditions is the cervix. Hence, in addition to being the original focus in the production of many acute inflammations, the cervix also serves as the portal of infection in the transmission of those subacute and chronic inflammations in the female, which even today are so little understood.

When a male suffers from gonorrhea, there is a purulent discharge, burning micturition, pain, and many complicating troubles and dangers so soon as the inflammation passes to the posterior urethra. (The gonococci are easily found.) Light cases are such as recover in a few weeks and do not extend to the posterior urethra. They heal quickly because the infecting gonococci are not virulent, or because the individual is not particularly susceptible and because the infection is limited to the anterior urethra. In women, too, infection by the gonococcus may begin with intense acuteness in the cervix, yet these patients may not seek medical aid unless the urethra or glands of Bartholin are affected, or unless the uterus or tubes and peritoneum are involved by a virulent rapid upward extension, which upward extension may occur in spite of great care, but which is often furthered by pelvic congestion, overexertion, or intracervical or intrauterine manipulation.

In virulent cases of gonococcus infection in women, when the activity of the inflammation is entirely or chiefly centered in the uterus, tubes, connective tissue, or peritoneum, the cervical affection for the time being is of minor importance. The evidence of inflammation in the cervix is then scarcely needed as an aid to diagnosis. After the acuteness of the associated complications has disappeared the cervical condition may furnish corroborative evidence, yet the other lesions enable us to make the diagnosis.

Acute Endocervicitis.—When, however, an acute endocervicitis, in the discharge from which gonococci can be readily

found, remains limited to the cervix alone, it causes relatively few symptoms. The cervix looks shiny, it is somewhat sensitive to pressure, there is a mucopurulent discharge, a red inflamed area about the external os, and gonococci can be readily found in the pus cells. We rarely see such localized cases early because the symptoms, when the disease is located in the cervix alone, are very few.

When such acute cases come under observation, some do so because of a complicating urethritis and painful burning micturition. Nevertheless, many women having a gonorrheal urethritis tolerate the associated annoyances, which gradually lessen, and either continue as a subacute process, or finally heal without medical attention. Other patients come because of a complicating Bartholinitis with gonococci in the secretion, which is only accidentally discovered, as the duct is not closed and an abscess in the gland is not found. It is the external complications which bring such patients to the physician, and it is then that an acute localized endocervicitis is usually discovered. Such cases located in the cervix may subside, of themselves or by conservative treatment, to the subacute or chronic form.

It is remarkable that cases of virulent involvement of the uterus show slight evidences in the cervix. There is little mucus and cervical discharge. It seems as if in such cases the cervix in its reaction to the gonococcus invasion showed but little resistance, because it was stimulated to the secretion of but little mucus, and thus infection was permitted to spread readily upward. In those cases with the greatest catarrhal involvement of the cervix, the cervix has reacted to the gonococcus invasion by the production of much mucus, and upward extension is either prevented or is of a very mild character. Then the picture changes to one of chronic catarrh with discharge, erosions, inflammatory ectropion, etc., yet examination at this later stage discloses gonococci only after careful search or after a recrudescence, and often not at all.

Subacute Endocervicitis.—Most cases of cervical infection are innocently acquired from a supposedly cured or supposedly harmless prostatitis in the male, and they naturally begin in

a subacute form. (The rule of Wertheim by no means always applies.) It is in the subacute cases that close study of the cervix is essential for the determination of evidences of the existence of an inflammation which, perhaps, has been slowly extending into the genital tract. There is nothing to suggest a marked involvement, nor is there anything to suggest gonorrhea as it is generally pictured. Examination by microscope shows no gonococci and often few pus cells. If the inflammation extends upward slowly to the uterus or tubes, such subacute cases seek medical aid because of sterility or because of pain due to involvement of the peritoneum or of the cellular connective tissue. These extensions often follow intrauterine manipulation or labor or abortion, which latter condition is of itself often due to a mild uterine catarrh and the consequent endometrial and decidual changes. Though no bacterial infection can occur in the uterus from below without first passing the cervix, yet in many cases distinct evidences in the cervix are absent. In many cases where the condition has extended higher up, very slight manifestations are present in the cervix, and the diagnosis must be made from the presence of concomitant lesions in the genital tract. In other instances the entire condition is limited to the cervix at the time of examination. Especially here, recognition of the existence of an infection in the cervix is important: (1) because the cervix is the original focus; (2) because from this focus emerge the inflammatory elements which continually infect the connective tissue about the uterus; (3) because we thus obtain corroborative proof of the existence of an inflammation which may have passed higher up, without any elements of acuteness and without causing any pain whatsoever. If the higher structures are invaded, they attract the most attention. If the cervix alone is affected, its conservative treatment is of doubly great importance. By proper care we may avoid that upward extension which yields negative symptoms in the form of sterility, or positive symptoms in the form of pain. Sterility due to salpingitis, and yet unassociated with pain, is often a symptom, and we must look for evidences of a causal

inflammation. This cause is generally a cervical catarrh produced by the secretion of a chronic prostatitis.

Evidences of Cervical Catarrh.—What are the evidences of cervical catarrhal inflammation?

Normal Cervix.—The normal cervix is covered by smooth vaginal, squamous mucosa. The wall is composed of muscle fibers; its canal is lined with high cylindric ciliated epithelium which secretes mucus of a clear, glairy nature. The external os demarkates a fairly clear line of division between the squamous epithelium of the outer covering and the cylindric epithelium of the canal. The line of delimitation is generally as sharp as that observed between the skin and mucous membrane of the lips. The cervix is not hard and the area of the internal os, except in some cases of congenital retroversion and elongatio colli, presents an elastic line of division between the cervix and fundus. The cervical portion of the uterus is embedded in connective tissue, and six ligaments filled with connective tissue and rich in lymphatics are connected with the cervix—the two broad ligaments, the two uterovesical ligaments, the two uterosacral ligaments. These, with the connective tissues about the cervix and the subperitoneal connective tissue which lines the pelvis, constitute the parametrium or pelvic cellular connective tissue. The cervix is freely movable and no sensitive points or infiltrations are felt about it. The normal cervix may be pushed up toward the symphysis, pushed back toward the sacrum, pushed toward the lateral wall of the pelvis, without pain and without limitation of mobility.

Variations from the Normal.—We can study the variations form the normal which are produced by mild or chronic cervical infection by observing: (1) changes in the squamous mucosa covering the cervix; (2) changes in the area of delimitation between the cervical canal and the squamous covering of the cervix; (3) changes in the cervical lining; (4) changes in the surrounding connective tissues; (5) changes in the cervical wall. Other lesions higher in the genital tract pass out from this original focus of inflammation and present subjective symptoms, as well as tangible lesions.

We are therefore concerned (1) with objective evidences, (2) with subjective evidences or symptoms.

Objective Evidences.—Under objective evidences we have: (1) changes in the squamous covering of the cervix in the form of erosions; (2) redness and signs of inflammation about the external os; protrusions of the cervical lining; inflammatory ectropion; (3) changes in the cervical lining produced by catarrh, which are evidenced by swelling of the mucous membrane and by the existence of a pathologic discharge; (4) changes in the connective tissue in the form of parametritis; (5) changes in the cervical wall in the form of cysts of Naboth or of diffuse hypertrophy; (6) over-growths of cervical mucosa in the form of polyps.

The Vaginal Form of Cervical Catarrh.—The vaginal portion of the cervix is covered with stratified squamous epithelium, under which are but few papillæ. The lowest layer of cells, the layer which separates the squamous epithelium from the connective tissue, is composed of low cylindric cells and is the so-called formative layer or stratum germinativum. The tissue under this epithelium is connective tissue rich in nuclei. The deeper layers are formed of muscular tissue radiating from the corpus uteri and constitute the main structure of the cervix. Inflammation of the cervix is of either the vaginal or the cervical type. The former means inflammation of the outer covering of the cervix, and is part of a vaginitis. In the vaginal form we observe redness or red isolated points or papillary areas, like those observed in vaginitis. Such factors, except in older women, suggest a gonorrheal etiology. In inflammation of the vaginal portion of the cervix the capillaries are turgid. New capillaries are formed under the surface and there is a grouping of round cells, especially around the new capillaries. Numerous papillæ are formed which pass up to the surface and are supplied with turgid capillaries, thus giving the red color to the surface.

The Cervical Form.—The second type may be called the cervical form, in which erosions are often present in conjunction with and due to a cervical catarrh. When smooth vaginal mucous membrane does not cover the entire surface of the vaginal portion of the non-lacerated cervix, but suddenly ends,

giving place to smaller or larger very red, uneven, and slightly bleeding spots, pathologic changes have occurred. This affection is generally situated immediately around the external os in its entire circumference. The red base is either depressed or else rises above the surface in the form of excrescences. Because of the external appearance, these lesions are called *erosions*. They must be distinguished from inflammation of the vaginal portion, from ulcers, and from ectropion.

Erosions mean that the vaginal part of the cervix which is normally covered by squamous epithelium evidences in the circumference of the external os the presence of cylindric epithelium to varying extents. Cylindric epithelium grows out from the cervical lining and takes the place of destroyed squamous epithelium. (1) In place of squamous epithelium there may be cylindric epithelium with a few glandular structures in the stroma. This is known as a *simple erosion*. (2) If the cylindric epithelium passes deeply into the stroma and then rises again, etc., a papillary appearance results and these areas are called *papillary erosions*. (3) If the surface is smoother, but glandular dilatations are present among epithelial depressions, they are known as *follicular erosions*.

In the early stages the stroma shows a small-celled infiltration, Therefore, in erosions, in place of the vaginal mucous membrane of the vaginal portion of the cervix and in a stroma normally free of glands, cervical epithelial cells with glands are present, showing, however, productive inflammatory changes. The theories which account for the origin of erosion are as follows:

Theories as to the Origin of the Erosions.—(1) The theory of Fischel: In the newly born, he says, the outer surface of the vaginal covering of the cervix is of cervical structure. Either this infantile habitus persists, or else squamous epithelium later makes its way over these areas and grows over the cylindric epithelium. When later on *irritation occurs*, it stimulates these once buried cylindric cells to growth and they appear on the surface.

(2) The theory of Ruge and Veit: They say that the cylindric surface epithelium with the depressions into the stroma originates from the formative layer and stratum germinativum of the

squamous epithelium. The upper layers of the vaginal cervical covering are thrown off in erosions and the formative layer remains as an independent covering in the form of cylindric epithelium.

(3) Abel asks why this lowest layer, which usually forms only squamous epithelium, should suddenly form cylindric epithelium. Fischel's theory explains some cases when the erosions are situated at a distance from the external os or form isolated islands. Abel says that an irritation causes the cervical epithelium to proliferate, and that this growth displaces the squamous epithelium. In most cases cervical catarrh is present.

I hold that the continued discharge of a cervical catarrh macerates the squamous epithelium, which is thrown off, and replaced by the cervical epithelium engaged in proliferation. This new epithelium then produces glands here, just as it normally does in the cervix. Whichever of the theories be correct, erosions are an evidence of an inflammatory catarrh, in the cervical canal.

The Significance of Erosions in Nulliparæ.—In nulliparæ especially, the presence of erosions speaks for a gonorrheal catarrh of the cervix. In women who have borne one or more children, and in whom perhaps other bacilli or bacteria may have been introduced, it is possible that a catarrh causing erosions may have another etiology. In women who have borne many children and in whom hypertrophy of the cervix is marked, and in whom lateral tears are slight, the area of the external os may look red and be covered with many, very small, hard follicles. The cervical canal is capacious. There is secreted a clear tenacious mucus. Posterior parametritis is never marked. Nothing suggests the degree or intensity of irritation observed in erosions or in inflammatory ectropion. It is conceivable, in fact, it probably happens often enough, that a cervical catarrh may go on to relative recovery. Dilatation of the cervix by labor, the ironing out of the cervical recesses, and hypertrophy of the cervix afford ample drainage to the canal. Successive pregnancies are followed by further dilatation and hypertrophy, and the final picture is by no means like that observed in sterile nulliparæ, in whom, in all probability,

cervical catarrh by upward extension has rendered pregnancy improbable. Many of such cases in multiparæ have been gonorrheal originally.

In older women and in women at the menopause new changes may take place about the cervix, if laceration exists, which are of the same character as the changes occurring in the vagina—senile vaginitis. The longitudinal folds of the cervical mucous membrane may give the external os a furrowed pinkish look, but hypertrophy and infiltration are absent.

Redness and Signs of Inflammation about the External Os. Though the point of junction of the squamous epithelium of the portio with the cylindric epithelium of the cervical canal is not always sharply delineated, yet the point of transition can be macroscopically recognized. In the presence of an inflammation there is sometimes a tiny ring of glazy redness and edema around the external os in nulliparæ. This symptom, though slight, is of very great importance. In other cases this margin of redness is a little wider and its edge is not regular, but looks frayed. This is probably due to the longitudinal folds present in the cervical canal. In other cases in nulliparæ or in women with non-lacerated cervices there is a slight protrusion of red, inflamed mucous membrane on the anterior lip and the posterior lip, just within the external os. There may be much secretion within the cervix of a very thick, extremely tenacious, white mucus. With this glazed area of redness about the external os, however, little secretion is generally noted. The Schultze tampon must be used. In the case of nulliparæ without lacerations the external os is dilated, the cervix is somewhat hypertrophic and edematous, and the slightly everted mucous membrane looks red and irritated and shows all the evidences of inflammation.

Ectropion.—The lining of the cervix is composed of cylindric ciliated epithelium which forms depressions that comprise the cervical glands. The cervical lining is arranged in longitudinal folds, beginning at the internal os and forming the arbor vitæ or plicæ palmatæ.

The epithelial cells are long, with transparent protoplasm, and are narrower at the base and have their nucleus at the base.

The stroma of the cervical lining is, in addition, rich in cells only directly under the cervical epithelium, for the main structure of the cervical wall is composed of muscle fibers into which project the base of the glands.

Ectropion means that the mucous lining of the cervical canal, in lateral lacerations of the cervix, has been everted. The everted mucous membrane is evident on inspection. If no catarrhal infection is present, the exposed cervical lining undergoes epidermoid changes and looks like squamous epithelium. With catarrhal inflammation there is a red, inflamed looking area which is known as inflammatory ectropion.

Secretion.—The normal secretion of the cervix is a glairy, tenacious, clear mucus. Hypersecretion is manifested by a pronounced increase in amount of secretion. This is often the result of congestion and not infrequently of onanie. When, however, an infection is present, the secretion is also increased in amount and its character is changed. It becomes either white or generally grayish, but may be yellow or green, showing variations according to the type and virulence of the infection. In every case the amount and character of the cervical discharge should be noted. After the vagina and outer cervix have been thoroughly cleaned, some of the cervical secretion should be removed and examined. In some cases where the canal of the cervix contains no mucus at the time, gentle aspiration by suction aids in collecting the contents of the cervical canal and yields valuable information (Figs. 12, 13). When the amount of the secretion in the cervix is large, the cervical canal is usually dilated and enlarged. In other cases the amount of the secretion is less, and it is of the greatest importance in these cases, to make use of the Schultze tampon, in order to determine the amount of discharge and to distinguish between the amount of secretion coming from the vagina and that which comes from the cervix and the uterus.

Examination of the Secretion.—A square cotton tampon is placed carefully and snugly around the cervix and left in place for twenty-four hours. This tampon is then removed with the aid of a bivalve speculum and whatever secretion is found in the center of its upper surface has come from the cervix and

the uterus. If the pathologic secretion comes only from the cervix, it will be entirely mucoid in nature and will be colored. If, however, the secretion comes from the cervix and uterus, there will be, in addition to the mucoid secretion, a non-mucoid secretion from the uterus; the two, however, not being mixed. If the secretion comes from the uterus alone, there is a non-mucoid discharge on the tampon. The mucous secretion on the tampon or the secretion from the cervix drawn from it by suction is spread upon a glass and stained. We find, then, mucus, various forms of bacteria and bacilli, pus cells, high cylindric cells from the cervix, low cylindric cells from the uterus, very often squamous epithelial cells due to metaplasia of the ciliated cylindric epithelium of the cervix or uterus, and in some cases gonococci or other micro-organisms. Examination of the mucoid secretion is not satisfactory, for the reason that most of the cells, epithelial, squamous, or pus cells, are enveloped by the mucus, and their shape and form are frequently altered. Gonococci, bacteria, or bacilli are almost never found in the mucus itself. If after careful cleansing of the outer covering of the cervix, squamous cells are found in the secretion obtained from the cervix or by suction, that fact is corroborative of the existence of an inflammation, generally gonorrheal, for a chronic gonorrhea often produces a change to squamous epithelium in the lining of the cervix. In old cases of gonorrhea or in cases subacute from the beginning, and especially in cases which are not treated by intracervical or intrauterine manipulation, it is extremely difficult to find gonococci, even when the examination is made shortly before or after menstruation. In spite of the fact that in chronic gonorrhea a clear mucus may be passed at times, an inflammatory cervical catarrh can be generally diagnosed definitely by anomalies in the secretion.

As to glandular changes, the round-celled infiltration of the mucosa of the cervix is generally superficial, but as the infecting bacteria enter the glands they produce infiltrations about them. The interstitial changes, however, are enough to obstruct the outflow from the glands and to cause cysts.

The cervix reacts to inflammatory irritation by the production of mucus. Hence, there are frequent cystic dilatations of

the cervical glands, and resulting cysts, follicles, and the *ovula of Naboth*. Through such dilatations and through their rising above the surface, follicular polyps may develop.

Ovula of Naboth.—(1) Where erosions are present on the vaginal portion, the ciliated epithelium which is present sinks deeper into the outer wall of the portio, its glands become obstructed at the outlet, and accumulations of mucus form little projections above the surface. These may eventually be covered by squamous epithelium. When the cervix has for a long time been the seat of catarrh, it may happen that the outlets of the glands which line it become obstructed. The cervical glands themselves are enlarged and elongated, and sink deeper into the wall of the cervix. Such obstructed glands may still further burrow their way through the cervical wall until their base extends out, close under the squamous covering of the vaginal portion.

When erosions are present, this condition can be readily diagnosed, for there is a red granular surface present which renders the diagnosis easy. In that form, however, which is due to the growth of the glands within the cervix the portio has no red irritated appearance, but under the squamous epithelium can be seen these single or multiple cysts projecting above the surface. When these projections are incised, a little glairy mucus is extruded. Their significance then is that they call attention either to changes in the intracervical glands or to change produced on the portio by extension thereon of ciliated cylindric epithelium.

Hypertrophy of the Cervix.—There are cases in nulliparæ in whom the existence of a chronic inflammation within the cervical canal produces structural changes in the wall of the cervix. The cervix becomes hard or rigid. These changes in nulliparæ, however, are not marked, for that would imply a deep extension of the inflammatory condition. Most of the involvement in such inflammations within the cervix is limited to the surface. The increased mucus discharge usually restricts the infection to the surface or to the glands and prevents an extension into the muscular wall. However, by continued hypertrophy of the mucous lining, or by the continued extension of the inflamma-

tory process beyond the area of the mucous membrane, inflammatory and fibrotic changes are produced which render the cervix hard, much thicker, and much larger in circumference. This more extensive form of hypertrophy of the cervix is observed in women who have borne one or more children. In them the cervix may be hypertrophied out of all proportion to the hypertrophy which has taken place in the remainder of the uterine wall. In a goodly number of cases the uterus, while more or less enlarged, is little changed in proportion to the tremendous hypertrophy which involves the cervix. These changes in the cervix are found in women who have gone through frequent labors, and represent long-continued mild inflammatory involvement, plus the hypertrophy of subinvolution, so frequently resulting from numerous labors. That this condition, however, is generally dependent on an inflammatory process is shown by the frequency with which this hypertrophy is complicated by a chronic involvement of the posterior parametrium.

In women who have borne children a hypertrophy of the cervix is often associated with a hypertrophy of the uterus also. The uterus is long and rigid. The everted cervical mucosa is pink or red, generally smooth, but often contains many white or yellow granular projections, like those observed in the throat and on the tonsils. Not infrequently pedicled or broad-based cervical polyps are present. A clear glairy mucus is noted. The canal is dilated. The change in the cervix is due to subinvolution and fibrosis of the cervix and uterus. There are no evidences of inflammation about the uterus. There is no posterior parametritis. The mucus shows no pathologic change. It is possible that streptococci, staphylococci, or bacterium coli or saprophytes may be introduced into the cervix, and may alter the character of the cervical mucus, but, as a rule, this cervical secretion represents hypersecretion.

We must therefore distinguish hypertrophy and posterior parametritis due to cervical catarrh from hypersecretion present in a hypertrophied cervix due to subinvolution. If the cervix is enlarged and the uterus is normal, it speaks for the

former. If both cervix and uterus are enlarged, it suggests either subinvolution fibrosis or inflammatory metritis.

When erosions, red external os, white or yellow mucoid discharge, and parametritis occur in a nulliparous woman, especially in one who has never been curetted, they are almost certainly due to a mild unrecognized gonorrheal catarrh. When erosions, red external os, white or yellow mucoid discharge and posterior parametritis occur in a woman who has aborted or has borne a child or children, especially if these conditions are resistant to treatment, they too are often the result of gonorrheal infection. Every cervical catarrh in nulliparæ or in younger multiparæ should be considered gonorrheal unless an exhaustive examination discloses another possible etiology.

If a woman has aborted or borne children or has been curetted, etc., we must, of course, take into consideration: (1) the possible introduction of other bacteria and (2) the retention within the uterus of macroscopic or microscopic fetal or decidual cells which cause a saprophytic fluor which discolors the cervical mucus. The other lesions noted in cervical catarrh, aside from erosions, red external os, white or yellow mucoid discharge, and posterior parametritis, are not so significant of gonorrhea. A distinction must be based on the presence of other lesions, the time at which they were acquired, and the age of the patients. A distinction must be made between nulliparæ and multiparæ.

The additional lesions produced by chronic cervical catarrh, such as ovula of Naboth, metritis colli, and cervical polyps, are produced by the action of various bacteria or cocci of a saprophytic type or by saprophytes which grow on the non-resistant tissues of subinvoluted uteri in older women or in the subinvoluted fibrotic uteri of women at or near the climacterium.

In catarrh involving the outer surface of the cervix, the vaginal portion or portio, we observe the same changes as in colpitis. There are no folds, as in the vagina, and changes in the papillary bodies do not occur so markedly, for the papillary bodies in the mucous covering of the cervix are not well developed. There may be either a diffuse intense redness or

red spotted alterations, looking like an eruption. There may be observed small excrescences resembling pointed condylomata.

SYMPTOMS

The two symptoms of endocervicitis are cervical mucoid discharge and the pain due to involvement of the cellular connective tissue. This involvement of the cellular connective tissue is called parametritis.

Parametritis.—The cervical portion of the uterus, in particular, is embedded in and surrounded by large amounts of connective tissue. The cervix enters into the upper end of the vagina at an angle with the latter. The position of the vagina, its relation to the levator ani, and its close union with the surrounding connective tissue, with the support furnished by the peritoneum, and by the surrounding ligaments, make the situation of the cervix a relatively fixed point. So long as the cervix is retained in this position and at this level, and so long as the uterus, its ligaments, and the parametrium preserve their natural elasticity, so long will the forces of pressure and tension within the abdominal cavity preserve the uterus in its normal anteflexed situation. The connective tissue about the cervix spreads out in the form of a six-pointed star. Each arm is covered by peritoneum, contains blood-vessels, muscle fibers, and lymphatics. Thus are formed the six ligaments which find their attachment to the uterus entirely or in part along the cervix or at the level of the internal os, the broad ligaments, of course, extending up the fundus. The base of the broad ligaments, which is particularly rich in muscle fibers and lymphatics, is called the ligamentum cardinale.

An important function of the connective tissue, with its numerous muscle and elastic fibers, is to keep the cervix in an elevated position, and the elasticity of the ligaments permits of free mobility of the uterus. As Winter says, the uterus may be pulled up to the symphysis, pushed toward the sacrum or up to the lateral pelvic wall or half-way up to the umbilicus, or the portio may be pulled down to the vulva, and all this without pain. When the uterus is pushed up or pulled down, it returns to its normal place because of the elasticity of its surroundings.

A chronic catarrh of the cervix may mean continued lymphatic infection. The uterosacral ligaments and the posterior parametrium are most frequently involved by the chronic catarrh. It is especially the uterosacral ligaments which are constantly becoming more inflamed through involvement of their lymphatic elements. After months or years they become sclerosed and shortened, causing backache and producing infiltration about the rectum and the sigmoid. In addition, there may be an invasion of the broad ligaments, though this

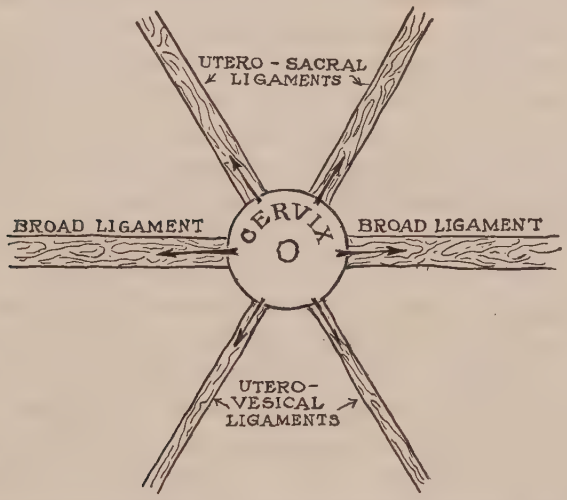


Fig. 132.—The parametrium. The cervix is surrounded by and embedded in a large amount of cellular connective tissue, which spreads out in the form of a six-pointed star. Each arm is covered by peritoneum, and contains muscle fibers, blood vessels, and lymphatics. This diagram illustrates the reason for early extension of inflammatory and malignant involvements of the cervix into the parametrium.

invasion is generally marked in chronic cases, only when associated with lateral tears. This posterior parametritis sometimes produces a retrodisplacement of the uterus. (See Fig. 105.)

Such cases of catarrh may remain located in the cervix and the surrounding connective-tissue areas, never passing, so far as evidences go, above the internal os. These patients may have children and may never suffer from uterine, tubal, or peritoneal annoyances. A cervical gonorrheal catarrh also which does not extend upward after an abortion or a pregnancy,

and thus permits of a second pregnancy, probably always remains in the cervix alone. Such patients finally manifest a large cervix, a normal or large uterus, a parametritis posterior, or a retrodisplacement or combinations of those conditions. Their main complaint is backache. Treatment often brings about a cure. Ofttimes the pain persists. They are then somewhat benefited by amputation of the cervix and by the performance of operation to correct the displacement. They are not infrequently best relieved by a hysterectomy. We must distinguish hypertrophy of the cervix plus parametritis, which are due to cervical catarrh, from hypersecretion present in a cervix and uterus hypertrophied as a result of subinvolution. If the cervix alone is enlarged while the uterus is of normal size, this condition speaks for the former. If the cervix and uterus are both enlarged, we are dealing either with subinvolution fibrosis or with inflammatory metritis.

DIAGNOSIS OF EROSIONS OF THE CERVIX

Catarrh of the cervix, or endometritis cervicis, is an inflammation of the cervical mucosa, extending from the external to the internal os, in the course of which inflammatory evidences may appear on the outer surface of the portio. It is easier to diagnose than endometritis, because part of the mucosa can be seen and because there are certain changes which occur on the portio with cervical catarrh only. If the lips of the cervix are everted by the use of volsella, the cervix mucosa is seen to be red, velvety, and shiny. Erosions, ectropion, follicles of Naboth, metritis colli, polyps, are sure signs of existing or previously existing cervical catarrh. Erosions are due to maceration and desquamation of the squamous epithelium and the covering of the denuded areas by cylindric ciliated epithelium which grows out from the cervical canal. Erosions may have a rough or furrowed surface and an irregular periphery. The color is a light red to a scarlet, sometimes bluish-red in pregnanacy. Simple erosions have a smooth even surface. A few follicles may be present in the circumference. Follicular erosions evidence many tiny follicles in the erosion or in areas covered by squamous epithelium or in areas of a red character.

Papillary erosions have a surface which feels smooth, but is of a finely granular character due to microscopic projections. They bleed easily when the mucus is removed; they are sharply outlined and contain no follicles. Erosions are to be distinguished: (1) from circumscribed reddening of the portio in colpitis, which latter is not concentric about the os, is not velvety, and bleeds very easily; (2) from a red congested cervix due to irritations produced, for instance, by a pessary; (3) from ulcerations of the cervix due to irritation and injury, as in cases of prolapse of the uterus; (4) from true ulcers of the cervix, which are usually syphilitic or tuberculous; (5) from ectropion, which means irritation and inflammation of the everted lacerated cervical mucous membrane. Only the papillary, and rarely the follicular forms, resemble malignancy. When the cervix is torn in labor and the lips gape, the cervical lining is often everted. If no inflammation is present in the vagina or in the cervical canal, the everted mucous membrane has sometimes a red appearance, but usually the epithelium undergoes epidermal changes and no redness is present. With inflammation the everted mucous membrane is markedly red, is elevated, and takes on the appearance of an ulcer or fungus. There is hyperplasia of the glandular epithelium and often hypertrophy of the glands. In other words, on the everted cervical lips those changes occur which take place within the cervical canal in cases of catarrhal infection. This condition is known as inflammatory ectropion. The everted mucosa is red, and folds representing the arbor vitæ of the cervix and also newly formed furrows are seen. It looks like fresh red granulation tissue, and if it bleeds easily, it may suggest carcinoma.

DIAGNOSIS OF ENDOCERVICITIS

One of the surest evidences of the existence of infection of the cervix is a slight zone of inflammation about the external os. This zone is of a bright and sometimes a dark red color and has a shiny appearance. Further proof is furnished by a slight extrusion of the red cervical mucosa of the anterior and posterior cervical lips. These two changes may be present with or soon after an acute invasion also. In the early stages of an infection

erosions are rarely formed. It is with the chronic catarrhal infection of the cervix that erosions take place. In the cervical catarrh of nulliparæ with narrow external os the mucus is retained and the canal is dilated. In all cases of cervical catarrh, and especially if the above evidences are absent, the secretion should be examined. The secretion may be clear or it may be grayish or yellow. It contains epithelium, leukocytes, or in more infectious stages it may be mixed with pus and be very yellow or green. The diagnosis between hypersecretion and inflammation is important. In the latter we find inflammatory changes in the mucosa, erosions, the admixture of pus, and often vaginitis. Cervical catarrh in the absence of these symptoms should not be diagnosed without anomalies in the secretion.

Follicles of Naboth are retention cysts which occur in the fundus of the glands of the cervix, or in the glands of erosions. They are small circumscribed projections containing translucent light or yellow mucous. If situated deeply, they may cause thickening of the portio. If this thickening is associated with interglandular hypertrophy, it is known as follicular hypertrophy.

Chronic induration or metritis coli, when not due to subinvolution and not part of a general uterine hypertrophy, is a sequel of catarrh. The cervix becomes thick and hard and fibrous. The cervix may be enlarged through concealed ovula of Naboth or through the extension of the chronic inflammation into the connective tissue and muscle fibers of the cervix and into the connective tissue immediately about the cervix.

Extension of the inflammation into the connective tissue about the cervix, or into the connective tissue of the six ligaments connected with the cervix, produces parametritis. By far the most frequent form is the so-called parametritis posterior chronica which involves the uterosacral ligaments and the posterior parametrium.

Pain in the back and limitation of mobility of the cervix are noted in chronic cases (Fig. 105). In newer cases the uterosacral ligaments feel swollen and tender on examination. Mucous polyps may be found in connection with chronic

cervical catarrh. They consist of circumscribed hyperplasia of the cervical mucous membrane. They vary in size from a pea to an egg and, as a rule, have a long pedicle. They are soft and shiny, red and covered with mucus, and bleed very easily. The surface is generally lobulated and they often contain small retention cysts. They are generally found in multiparæ after the existence of an extremely mild, long-continued intracervical irritation. In women near the climacterium they speak rather for a saprophytic involvement of cervical tissue non-resistant in character.

TREATMENT

Treatment of cervical catarrh should be conservative and carried out entirely in the vagina and not within the cervix. Our whole purpose is to remove from the cervical canal the causes and the products of the inflammation. The cervical lining is not smooth, but is composed of deep depressions forming an irregular surface. The bacteria, bacilli, or cocci which are producers of the inflammation may be located deep down in these recesses, even if not diffusely so, or between the epithelial cells or underneath the epithelial cells.

Local applications cannot destroy the bacteria in the depths without damaging to a certain extent the entire cervical lining. In my experience, local applications keep up the irritation. Most chemical agents produce hard, sclerotic changes, and the tendency is to send the inflammation further into the cervical structure and out into the surrounding connective tissue. Our whole purpose, then, should be devoted to gently cleaning the cervical canal and draining out all the products of inflammation in the deepest recesses, and in this way aiding nature in throwing off the remaining infecting bacteria. If the cervical secretion is extremely tenacious, only as much as can be done without injury should be removed by gentle sponging and cotton applicators. By the use of a suction bulb, as much more as possible should be drawn out (Figs. 12, 13). Then boroglycerin to the amount of 1 ounce is poured into the vagina through the bivalve speculum. The fornices are afterwards gently but firmly packed with one long strip of 3-inch wide soft gauze. This brings the glycerin into intimate contact with the intra-

cervical mucosa. The long strip of gauze is then gently packed into the vagina and the whole is allowed to remain in place for twenty-four hours (Figs. 61, 63, 104). As a result, a large amount of serous exudation takes place, the glycerin drawing out the cervical contents and acting on the deeper recesses as well. At the end of twenty-four hours the gauze is taken out and a vaginal douche given. This treatment by glycerin is carried out two, or better three, times each week. Regular examination of the cervical secretion corroborates the apparent improvement. The secretion gradually becomes paler in color and thinner, and finally quite clear. At this time, microscopic examination shows almost no pus cells and only squamous cells. Under this treatment, the cervical secretion finally becomes clear and our purpose is accomplished without irritation. I rarely use intracervical topical applications of any form, except perhaps once to produce an increased discharge as an aid in the final microscopic diagnosis. Intracervical applications of 6 to 12 milliamperes of the negative pole of the galvanic current, however, are of material assistance in promoting drainage of secretion from the cervical glands.

The *erosions* are treated by local applications of carbolic acid, followed immediately by a thorough painting of the whole cervix and fornix with tincture of iodin. Glycerin, which is used for its effect on the cervical lining, is of undoubted value in the cure of erosions, for it dehydrates and draws out from the depressions in the erosions the inflammatory products. The choice of medicated douches which are used in conjunction with this treatment depends on the stage of the condition and on the associated bacteria found by examining the vaginal secretion. The three best drugs are, first, acetate of aluminum, 1 dram to the quart, because of its healing effect; oxycyanid of mercury, 1 : 5000, because of its destructive action on associated bacteria and its great value in those cases where gonococci are found; and an astringent powder in the form of sulphate of zinc plus tannic acid 2 drams to the quart, which is of use in the later stages where hypersecretion still persists.

Patience is a virtue in the treatment of cervical erosions, as their cure not infrequently takes several weeks. It is not

sufficient to make local applications to the external surface of the cervix. The associated cervical catarrh must be treated and cured. The best form of treatment is the application of pure carbolic acid by cotton applicator to the entire erosion area. The application is allowed to remain for only a few seconds if the erosions are superficial; but if the erosion is papillary or glandular, the carbolic acid must be allowed to act longer, to destroy the columnar epithelium which is growing in the area normally covered by squamous epithelium. The application of carbolic acid is then immediately followed by several applications of pure tincture of iodin, which is applied also to the entire cervix covering and to the vault of the vagina. The alcohol in the iodin tincture partly neutralizes the further action of the carbolic acid and the iodin is applied for its alterative and antiseptic properties. An ounce or more of boroglycerin is then poured into the vagina and the vagina is filled with gauze, which is thoroughly packed into the fornices. The gauze is removed at the end of twenty-four hours and vaginal douches are given twice daily consisting of the above-mentioned three drugs or of three to four tablespoons of pyroligneous acid in 2 quarts of water. The applications to the cervix of iodin are made three times a week, the carbolic acid being applied once or twice a week, according to the degree to which the ciliated epithelium has been destroyed. Unless the ciliated epithelium is entirely destroyed (and not too deeply at any one time, in order to avoid bleeding or oozing) the erosion will not heal. When healing takes place, the squamous epithelium is seen to gradually grow in from the edges. In the later stages its growth may be stimulated by the local application of nitrate of silver from 1 per cent. up to 5 per cent. This may also be done once or twice a week. The purpose of the boroglycerin treatment is to draw out the cervical mucus and thus relieve the cervical inflammation from the very depths of the glandular recesses. When the canal becomes clearer and the mucus becomes colorless, the lining of the cervix may be gently painted with tincture of iodin or with 1 per cent. nitrate of silver.

In the treatment of erosions stubborn cases must be painted with 50 per cent. solution of chlorid of zinc. In other cases

the erosion must be painted with pure pyroligneous acid or with pure formalin followed by the boroglycerin treatment. The cervical canal in certain obstinate cases is gently cleared of its mucus and is painted with 2 to 5 per cent. silver or with 10 per cent. solution of chlorid of zinc. In my experience the avoiding of intracervical treatment is in most cases followed by good reparative results and no induration, inflammation, or stricture of the canal takes place.

If follicles are present, they should be opened, the mucus squeezed out, and the little recess should then be touched with carbolic acid, followed by iodin.

A distinction must be always made between erosions and ectropion. Ectropion simply represents the everted mucous membrane of the cervix, when deep lateral tears are present. Hence ectropion is found only in women who have borne children, while erosions are present in nulliparæ or multiparæ, more frequently in the former. In cases with marked ectropion or in erosions of the cervix associated with diffuse hypertrophy, especially where the cervix is filled with dilated follicles, high amputation of the cervix gives an immediate and satisfactory result.

Local applications to the lining of the cervix which exert a superficial action are of no utility for destroying the causes, and certainly of no value from a healing standpoint, *so long as a mucus plug obstructs the cervix and bacteria are still present in the glandular recesses*. If for no other reason, routine intracervical treatment is contraindicated in such conditions. Local applications to the cervical lining which have a deep cauterizing action often only serve to keep up the inflammation, to disseminate it in the cervical wall or into the surrounding connective tissue or further up into the uterus, and often higher still. The element which frequently transmits the cervical infection (if gonorrheal) further up is parturition, in which case we have, as a rule, a late infection. Abortion is also a frequent factor in sending an infection further up. A curetting is of still greater danger in causing an ascending extension of the original cervical condition. Ectopic gestation occurs more frequently in women who have borne children than in

women pregnant for the first time. This is due to the fact that parturition often results in an ascending infection which mildly involves the tube. If the involvement of the tube is sufficiently marked to cause closure of the external ostia, these patients are permanently sterile. If, however, the cocci are less virulent the tubal ostia are not closed, the infection in the tubes is not so extensive as to prevent regeneration of active ciliated epithelium, and the sterility is only temporary, though it may last for years. Women are rarely treated for secondary sterility, and in such cases no additional harm is done by intracervical or intrauterine applications. In other words, no increase of the tubal affection is produced. Therefore the tubal affection in such uniparous women is often relatively slight, and in them, or even in more severe cases, goes on to recovery or else is almost healed at the time when the ectopic gestation occurs. Nulliparæ, on the other hand, are frequently treated for sterility. The cervix is dilated, the sound is used, curetting is done, intrauterine applications are made, the mucosa is constantly irritated, inflammatory extension upward is constantly stimulated, and as a result the tubes grow progressively worse and have no chance to heal, even partly. Therefore either the tube-ends become closed or the ciliated epithelium in the tubes is in such a state that no ovum is drawn into the lumen and ectopic gestation in them is much less frequent. Many nulliparæ have a specific (gonorrheal) cervical catarrh without any knowledge of it, but become pregnant before sufficient harm is done to both tubes to prevent the ovum from entering the uterus.

ENDOMETRITIS

A healthy endometrium is essential to the functions of normal menstruation and of pregnancy. The endometrium in its structure is very much like lymphatic tissue. It is lined on its inner surface by a single row of epithelial cells and contains in its lymphatic stroma glands whose epithelial lining is in direct continuity with the single layer of epithelium which lines the endometrium. This endometrium undergoes, from the age of thirteen on, a periodic monthly stimulation by the ovarian secretion which results in a periodic hypertrophy of all the constituent elements and in congestion of the blood-vessels and capillaries. The purpose of this periodic stimulation is to furnish a proper basis in which an ovum, if fecundated, may grow. The endometrium naturally undergoes alteration in connection with, and in consequence of, its intimate relation to the local processes involved in menstruation and in pregnancy. At a later period, at the climacteric age, the endometrium, through atrophy of the ovaries, undergoes regressive steps, the course of which may be changed by the injuries which it has sustained during the various periods of life.

The uterus with its lining is at all times under the direct trophic control of the ovaries and their secretion. Normal ovaries are necessary to the production of a uterus and endometrium capable of performing the regular function of menstruation and of furnishing a nest for the development of a fecundated ovum. The endometrium through direct involvement of its own elements, through interference with its blood-supply, through involvement of its trophic centers, the ovaries, may at various periods undergo alteration in its character and structure. The endometrium is liable to changes during childhood. It is subject to injuries as a result of local or constitutional infectious diseases at any period. It is subject to injuries in connection with pregnancy and undergoes alteration in the presence of new-growths.

Etiology.—In childhood there is an etiologic factor to be considered under the head of the infectious diseases, such as measles, scarlatina, mumps, typhoid, diphtheria, etc. These diseases not infrequently produce lesions of varying degrees in the ovaries themselves or in the lining of the uterus. Such alterations may be temporary or permanent. If permanent, they begin to manifest symptoms when the ovaries and endometrium enter into the menstrual phase. There may be either early changes in the endometrium due to direct involvement of the uterine lining itself in the course of these infectious diseases of childhood, or secondary changes in the endometrium due to impairment of function in the ovaries themselves. These latter lesions are trophic in their nature.

In children another causitive factor may be infection of the genital tract by the gonococcus, which manifests itself, as a rule, in the form of an acute vulvovaginitis. This disease is very difficult to cure, because the gonococci thrive exceedingly well on the genital epithelium of the child. It is, however, not generally recognized that in many cases the gonococci produce an infection of the cervix, and that factor plays an important part in keeping up the inflammation in the vagina and vulva. In addition, in not a few instances, even when no symptoms are present, the uterine lining itself is involved. In cases in which the inflammation is present in the endometrium it may extend up into the tubes and out into the peritoneum. While not widely recognized at the present time, a gonorrheal peritonitis in children is by no means uncommon. It is certain that gonorrhea bears an important relation in such cases to the subsequent condition of the endometrium, either primarily, through the direct involvement of the uterine lining, or else through some involvement of its trophic centers, the ovaries.

When the menstrual function begins, existing alterations in the structure of the endometrium considerably influence the course of menstruation. Other infectious diseases, such as typhoid fever, also affect the endometrium in later life either primarily and directly, or secondarily through the involvement of the ovaries. At this period, and at any other subsequent

stage, congestions in the genital tract certainly have an important bearing on the character and growth of the endometrium. Among the causes of pelvic congestion a place of importance must be given to onanie or masturbation.

A further important etiologic factor in adult life, and one which is inflammatory in its character, is infection by the gonococcus, which may be acute or subacute in its nature. In fact, a very large proportion of gonorrheal infections of the endometrium are of so mild a character as to be scarcely recognized until associated lesions call attention to their existence. Here, too, involvement is primary and direct, but may be complicated by involvement of the trophic function of the ovaries.

An element of importance with regard to the endometrium is concerned with that period of the female life in which pregnancy may occur, and here due consideration must be given to interruptions of pregnancy in the form of abortion, ectopic gestation, labor at full term, etc. The changes to which the endometrium is then liable are due to the relation which the endometrium bears to the growing ovum. Alterations in the character of the endometrium may be due to the fact that cells of the trophoblast or chorionic cells or placental structures remain and prevent a return to the normal. Even if no cells of the ovum be left behind, a complete restoration to the normal implies a disappearance of the decidua and a substitution by normal endometrium. However, decidual cells or the entire decidual membrane may remain or the mucosa may return only partially to the normal. Another factor of importance in connection with pregnancy is the failure on the part of the uterus to return to its normal size. This condition is known as subinvolution, and is one wherein congestion and hyperemia play an important part in altering the form and structure of the uterine lining.

Various infections may occur in connection with pregnancy, which are generally grouped under the title of puerperal infection. This is of two forms: (1) Puerperal infection may be due to bacteria and bacilli introduced from without by examination or intrauterine manipulation, or (2) it may be due to bacteria present before pregnancy, which bacteria are frequently

gonococci. Either streptococci, staphylococci, the bacterium coli, the gonococcus, or saprophytic bacteria and cocci are usually found in these infections.

Diseases in the structures adjacent to the uterus have a bearing in altering the appearance or function of the endometrium, either through the pressure which they exert on the vessels supplying the uterus or because the pathologic process is inflammatory in character. Since most of the inflammatory conditions about the uterus are the result of infection extending through the uterus, we are really concerned with alterations in the endometrium due to the same causes as produce the perituterine inflammation, or else with alterations in the endometrium resulting from inflammatory involvement of the periuterine vessels and of the ovaries. Among the bacterial infections to which the uterus is liable must be mentioned that by the tubercle bacillus, which, while rare, does occur in the form of an ascending infection from the cervix, or in most instances in the form of a descending infection, subsequent to involvement of the peritoneum.

Aside from these changes in the endometrium, new-growths have an important relation to the lining of the uterus. It is natural to expect a deviation from the normal with sarcoma or carcinoma, but as these two conditions have symptoms of their own, the alteration in the character of the endometrium is of secondary importance. With myomata, however, the circumstances are different. There may be either small unrecognized tumors or larger recognized tumors. When myomata are situated in the uterine wall, or particularly when they are located under the mucous membrane, it is only natural that their presence and the pressure which they exert and the congestion which they produce, together with the zone of hyperemia about their periphery, should cause alterations in the character and structure of the uterine lining.

At a still later period, the time of the climacterium, the uterine lining is supposed to undergo regressive changes. Here, too, variations in this process may take place, sometimes because of the alteration produced in earlier years, at other times depending on the changes which are going on in the ovary. Many

local changes, therefore, are dependent on the trophic action of the ovaries; hence the various deviations from the normal which are so frequently found at the climacteric period.

Non-inflammatory Alterations of the Endometrium.—The uterine lining may undergo modifications by any new-growth involving the uterine structure, such as carcinoma, sarcoma, and fibroma. Carcinoma and sarcoma are affections which have a definite appearance and symptoms of their own. Fibroids, whether single or multiple, whether large or small, especially if situated in the uterine wall and near the mucous membrane, produce changes especially marked in the glands of the endometrium. Though this condition with large tumors is of secondary importance, and the associated hyperplastic changes due to the presence of fibroids are called endometritis, it can readily be seen that inflammation plays no part in causing this change. When a pregnancy has existed in a tube, the uterine lining undergoes a change to decidual tissue. During the various stages of ectopic gestation this decidual lining may be thrown off, may retrogress and return to the normal state, or may remain more or less subinvoluted. This may leave a hypertrophic uterine lining which involves the glands also, and which is called endometritis, but, again, is not inflammatory in etiology. With a pregnancy interrupted at any stage, that is, with abortion, the endometrium or decidua may fail to return to the normal. Either the decidua is retained in whole or in part, or else it does not return entirely to the normal or else microscopic or macroscopic remains of chorionic villi are retained. This may produce a form of so-called hypertrophic endometritis involving the glands and interstitial cells too, but is likewise non-inflammatory in its causation.

In labor occurring at full term the uterine lining is thrown off, leaving only the deeper glandular areas in place for the purpose of restoring a normal endometrium. Here, again, the decidua may not be cast off as it should be. There may be a retention of macroscopic or microscopic chorionic cells or placental structures, and a condition also called endometritis results, which is not inflammatory in its nature. Even if in all of these pregnant states the decidua is cast off completely, and even if chorionic

or placental cells do not remain, a failure of involution on the part of the uterus may keep up a persistent state of hyperemia which prevents the growth of a normal endometrium and frequently produces a hypertrophy or overgrowth, or also a hyperplasia involving especially the glands. This, again, is a non-inflammatory "endometritis." Retroflexions of the uterus, especially post-partum displacements of the uterus associated with descent, and even normally situated uteri, particularly after labor or abortion, are often accompanied by congestions which prevent the endometrium from remaining normal. This, again, is a non-inflammatory "endometritis," hypertrophic and hyperplastic in character. The same disturbances may be evidenced in pathologic cardiac and constitutional affections, with which congestions and abnormal blood-supply in the pelvis and uterus are supposedly associated. General subinvolution after labor implies a state of systemic inelasticity and unevenly distributed blood-supply. Here all the abdominal and pelvic structures are affected by venous congestion and stasis. The ovaries, perhaps, in some cases exert an undue and abnormal stimulation upon the endometrium, produce excessive hyperemia and congestion, and eventually aid in the formation of an overgrowth of the endometrium. Ovaries involved by inflammatory or degenerative processes, as a rule, under-stimulate the endometrium, and at the same time fail to exert a normal trophic action on the uterine muscle. As a result fibrotic and sclerotic changes occur in the muscle and elastic fibers of the uterine wall, and arteriosclerotic involvement of the blood-vessels and capillaries occurs. Such alterations, if associated with circulatory disturbances in the uterus and endometrium, may lead to hypertrophy rather than atrophy.

Inflammatory Endometritis.—The inflammatory form which really justifies the name of endometritis, and which is, in almost all instances, at least interstitial in its microscopic characteristics, is almost invariably due to the action of bacteria. The evidences are those associated with inflammation in any mucous membrane. Quite frequently the process is mild or subacute or chronic, and for that reason simply "catarrhal" in its manifestation.

As mentioned above, changes in the endometrium may often be referred back to the inflammatory or necrotic alterations in the uterus complicating the infectious diseases of childhood or to infection by the gonococcus in early life.

Bacteria, bacilli or cocci, and the pathological changes resulting therefrom may be present in a nulliparous uterus or in a uterus in which at one or more times a pregnancy took place. In the case of pregnancy, whether terminating in abortion or at full term, we are concerned with the so-called septic or puerperal infections. Here we are dealing with streptococci, staphylococci, in some instances with bacterium coli, and in many cases with gonococci, or else we are dealing with saprophytic bacteria which grow on dead tissue only and which cannot survive in the living endometrium itself. These saprophytic bacteria may produce changes in the uterine cavity if placenta or membrane or other products of conception are present, but once these are removed the saprophytic bacteria disappear. On the other hand, the streptococci, staphylococci, and bacterium coli grow in the structures of the uterus and produce an endometritis or a metritis, or any or all of the various inflammations usually included under the heading of post-partum infection. In addition to these, a very large number of cases are due to the gonococcus. The gonococcus, when present before a pregnancy, or introduced after conception has taken place, affects the uterine lining and the uterine wall primarily, often all the other periuterine structures, and plays a very important part in the production of endometritis. In cases in which pregnancy has never occurred, the streptococcus, the staphylococcus, or the bacterium coli find their way into the uterus during operation or by intrauterine manipulation, except for an occasional lymphogeneous or hematogenous infection. Therefore an inflammatory endometritis produced by these invaders suggests some previous intrauterine manipulation. But, the vast majority of cases of inflammatory endometritis in nulliparæ are due to gonococci. The gonococcus may produce an inflammation in the uterine lining which is acute or subacute. While the gonococcus has the characteristic in most cases of growing superficially and exercising its energies mainly on

the mucous membrane, in a certain proportion of cases its action is not alone superficial, but deep, involving the uterine wall to varying degrees and extending out into the lymphatic connective tissue. Hence, the great variations in the course of gonorrheal infections are due to the fact that the infection is either acute or subacute, superficial or deep. Many of the symptoms generally associated with an endometritis, gonorrheal in its nature, are not so much due to the endometritis as to the associated metritis.

Associated Changes in the Uterine Wall.—Any discussion of the affections of the endometrium must include a consideration of possible concomitant structural changes in the uterine wall. When there is an inflammatory endometritis the same bacteria or cocci may, and probably do, involve the uterine wall, producing changes there in the character, amount, and structure of the component elements, and the consequent alteration in the function of the uterine wall has a bearing on the symptoms supposedly or actually associated with the involvement of the endometrium alone. On the other hand, disturbances in the ovarian trophic center, or such changes as are associated with pregnancy in the tube or uterus, may likewise produce alterations in the uterine wall. The important changes in the uterine wall with a non-inflammatory cause are those changes known as subinvolution, which means hypertrophic and fibrotic alteration with consequent modifications of the symptoms supposedly or actually associated with the alteration of the uterine lining.

With any of the non-inflammatory causes mentioned above there may be combined an inflammatory etiology. An inflammation may be present before or may be acquired during or after the pregnant state. This causes a complex condition, that is, a combination of the inflammatory form of endometritis and the non-inflammatory forms mentioned above. Therefore, to repeat again, endometritis may be inflammatory, non-inflammatory, or a combination of the two.

Interstitial and Glandular Changes.—The term endometritis is generally used to include all these alterations of the endometrium which are not malignant or which do not practically or

really form a new-growth. Under the heading endometritis are usually grouped those affections of the mucous membrane of the uterus in which the microscope shows changes in the structure of the essential component elements. The changes represent differences either in the character or in the amount of the elements composing the endometrium. Reference is usually made (1) to alterations in the stroma or interstitial round-celled connective-tissue basis of the endometrium, or (2) to changes in the glands situated in the stroma, or (3) to a combination of the two. It is customary to speak (1) of interstitial endometritis which affects the connective-tissue stroma in character and amount, (2) of a glandular endometritis which affects the glands in size, character, and number, and (3) of a combination of the two. Although a certain proportion of the cases of endometritis are inflammatory in etiology, a large number are not. Some gynecologists consider the interstitial form as inflammatory and the glandular as non-inflammatory. Microscopic evidences in the hands of the many observers have shown glandular changes to be also present with inflammatory causes, so that an exact line of division does not exist.

Even though this be so, it is true that a very large number of cases of purely "glandular endometritis" are not to be referred to the irritative action of bacilli and bacteria, but are due to the non-inflammatory causes mentioned above. Inflammatory cases, however, always show interstitial endometritis. Interstitial endometritis is always inflammatory. The lining of the uterus is at all times under the trophic control of the ovarian secretion. The endometrium undergoes special periodic stimulation at the menstrual period in the form of hypertrophy of all the elements. It undergoes still further changes during pregnancy, either uterine or tubal, in the form of decidual reaction. In the case of uterine gestation the endometrium is invaded by trophoblast cells of the ovum and by chorionic villi. Alteration of the ovarian secretion, whether subsequent to the presence of ectopic gestation or to the presence of an ovum in the uterus, often results in or is followed by permanent changes in the form and character of the uterine lining. These changes not being inflammatory, are not interstitial in their character,

but glandular, hypertrophic, and hyperplastic. If, however, with any of these non-inflammatory causes an inflammatory etiology is also present, then there is, in addition to the glandular change, an interstitial alteration, and it is probably this fact which makes the combination of the two so frequent. In other words, there may be: (1) an inflammatory interstitial change superimposed upon an existing glandular non-inflammatory alteration; (2) or associated glandular changes resulting from the congestion and hyperemia consequent upon the presence of interstitial inflammation in or about the uterus. If any inflammation of the uterus involves the ovaries, a glandular trophic condition may be added to the local inflammatory. If the wall of the uterus is affected by inflammatory invasion, disturbances in the form of congestion take place, with resulting hypertrophic hyperplastic glandular growth, so that even though inflammation is responsible in many cases for glandular alterations in the endometrium, they are really secondary in their nature, and are due either to the trophic involvement of the ovaries, or to the changes consequent on congestion and hyperemia. In other words, they are, strictly speaking, not the immediate result of the inflammatory reaction itself.

Therefore, for all practical purposes it would be well to speak of the interstitial form as inflammatory, the entirely glandular form as due to non-inflammatory causes, and the combined glandular and interstitial form as due to both causes, with the inflammatory interstitial change as the important involvement.

In considering the various direct local disturbances which may take place in the endometrium due attention must be paid to (1) causes inflammatory in their nature, (2) causes which are not inflammatory.

Endometritis may therefore be considered under these two headings. The inflammatory forms include acute infections of the endometrium which are due to puerperal infection and to the gonococcus and other pyogenic micro-organisms. This also comprehends the local changes occurring in connection with constitutional diseases, and the infectious diseases of childhood, especially scarlatina. The subacute purely local inflammations of the endometrium are in almost all instances due to

gonorrheal infection. Inflammatory involvement of the endometrium may be either superficial or deep; it may be diffuse or circumscribed. It may exist as a simple endometritis without involvement of the uterine wall, or in conjunction with an involvement of the uterine wall. An inflammation of the endometrium may exist without extension into the tubes, peritoneum, or periuterine structures, or it may occur in conjunction with these conditions. All these variations of superficial infection, deep infection, diffuse or circumscribed involvement, simple endometritis, or endometritis with involvement of the uterine wall may be present with either the acute or subacute forms.

"Endometritis" from the Standpoint of Microscopic Findings. Endometritis should be considered next from the standpoint of microscopic findings. (*a*) *An acute inflammation* of the endometrium is interstitial in its character. In the chronic form and in acute recrudescences there are only circumscribed groups of round-celled infiltration. As a result of the increase of small round cells there is thickening of the entire mucous membrane, there is an increased blood-supply, and the endometrium looks red. There is a growth of the small round stroma cells. The round cells which constitute the stroma of the endometrium are increased in number. They consist of a round nucleus which fills out the entire cell so that almost no protoplasm is evident. The glands in the endometrium are separated and pushed apart by the increased interglandular tissue, and for that reason seem diminished in number. In addition, there is infiltration by round cells, such as is usually observed with any inflammation. In interstitial endometritis we have all the changes characteristic of inflammation. The interstitial tissue is infiltrated with small cells in proportion to the severity of the inflammation. The round cells completely replace the original cells of the interstitial tissue in certain areas, so that gland sections are absolutely surrounded by small-celled infiltrations. The epithelial cells of the glands proliferate in certain areas as a result of the increased blood-supply. The small round cells become larger and epithelioid in form through the increased nutrition due to the newly formed vessels present with inflammation.

There is another interstitial involvement of the endometrium, which, however, is *exudative* in form, and which clinically manifests its presence by the existence of a sensitive endometrium and by the symptom of dysmenorrhea. There is a seroalbuminous exudate between the stroma cells which looks like a finely dotted mass and which pushes the cells apart. There are also scattered areas of round-celled infiltration and the glands are compressed. The exudate is irregularly distributed and in some areas cells are close together and in other parts cells are pushed apart. Although not generally considered as inflammatory in etiology, some cases, if not all, are probably of this character.

If there is no restoration to the normal after an acute interstitial inflammatory involvement of the endometrium, there results what is known as a chronic interstitial endometritis. The epithelial cells become fusiform and stellate and form fibers. Spindle cells are then present in place of the round original cells. The round cells are mixed in with the spindle cells and the uterine lining has a fibrous appearance. A further stage of this process results in *atrophy or cirrhosis* of the endometrium. The endometrium becomes thin, its surface is irregular, there is an irregular line of demarcation from the muscularis, and the vessels are dilated and thickened. Inflammatory recrudescences are evidenced by the presence of new round-celled infiltration among the spindle cells. Such cases are helped but little by curetting, and by this operation very little membrane is obtained because of this atrophic change. The glands are compressed and atrophic. The final stage forms what is known as *atrophic endometritis.*

An interstitial endometritis often produces an irregular picture if the glands are compressed and if recurrent attacks cause sclerotic changes in the stroma. Just as in cirrhosis of the liver there is compression, so the interstitial tissue compresses the glands. They become dilated or cystic and contain cell detritus. These dilated glands, in turn, compress the stroma so that dilatation or ectasia of the glands results. The presence of cysts combined with the presence of spindle cells speaks for a chronic inflammatory process.

(*b*) In discussing *non-inflammatory involvement* of the endometrium the chief factors to be considered are the changes produced by abortion, by the retention of decidua, by subinvolution of the uterus, by displacements of the uterus, by the presence of myomata, or by trophic changes resulting from involvement of the ovaries. That a peculiar microscopic appearance should be observed in the non-inflammatory cases is to be expected.

An "endometritis" resulting from such an etiology is non-inflammatory, hypertrophic, hyperplastic, and glandular in its nature. There is an increased growth of the epithelial cells. There are papillary elevations of the surface epithelium and the contour of the uterine lining is wave-like. The mucosa becomes thicker. The glands are enlarged and dilated, and for that reason come closer together. When the glands are still further increased through epithelial growth, they become twisted and screw-like in shape. Through the increased extent of epithelial surface there takes place a papillary appearance in the glands, which on section gives them a saw-like appearance. Glands become dilated by the increased secretion and may become cystic. The whole endometrium is thickened. Hyperplasia may also take place. New glands are formed from the surface epithelium and branches are given off from glands, either by eversion or by inversion.

Glands increase by a process going on in the gland lumina and called inversion, or by a process taking place outside of the glands and called eversion. Hypertrophy means an increase in the size of the glands. Hyperplasia means an increase in the number of glands produced by division or by glands given off from the main glands with an increased number of lumina. A still further change is the growth of the glands into the muscularis of the uterus. This latter condition readily recurs after curetting or treatment, and spontaneous cure at the menopause age seldom occurs (Winter).

(*c*) In a combination of the interstitial and glandular form the glands are enlarged and papillary, but instead of being near together, they are pushed further apart by the increased interstitial tissue. Evidences of interstitial inflammation are

present. If in connection with interstitial endometritis the glands become wider, and if papillary epithelial projections are present in the glands, we have an endometritis interstitialis and glandularis. If in glandular endometritis with enlarged glands and saw-like glands the glands are not close together and there is an interstitial change, there is endometritis glandularis and interstitialis. When it is difficult to determine whether there is more glandular or interstitial change, the term diffusa is used.

Endometritis fungosa defines a change in the endometrium in which the mucosa projects above the surface like a fungus. Sometimes there is more of the interstitial change, sometimes more of the glandular. At any rate it signifies a hyperplasia as the basic alteration, and refers particularly to the glands.

In some cases of myoma the surface layers show interstitial changes while the deeper layers show a glandular change.

In the hemorrhagic form of endometritis the microscope shows an endometrium which looks like menstrual membrane. In some cases the appearance is so characteristic as to be termed apoplexy. In the above various conditions involving changes in the endometrium the vessels may show no change; they may be dilated, there may be hemorrhage in the tissues, the walls of the capillaries may be thickened, the entire endometrium may look like the endometrium of menstruation, and, as said before, so much blood may be present in the tissue that it deserves the name of apoplexy.

Characteristic Differences under the Microscope.—In acute interstitial endometritis there is an increase of the small round cells. In the subacute or chronic form spindle-shaped cells predominate. In the dysmenorrheic form we find in the mucous membrane round cells which possess a protoplasm and a small sharp nucleus, and the cells seem to lie free in the interstitial and exudative tissue. Spindle cells and larger cells with protoplasm are also present and the entire picture resembles that of decidua. In decidua, however, all the cells are changed. In the interstitial and in the exudative forms the change is not uniform. In addition the intercellular substance in decidua is homogeneous and but little fibered, whereas, in

exudative endometritis it is finely dotted and fibered. Presence of ectatic glands, cysts, and bands of spindle cells suggests chronic inflammation. In glandular endometritis with myoma the stroma cells are much enlarged and resemble decidua or sarcoma, but a distinction exists, for in decidua the nucleus stains poorly and there is exudate between the cells. In endometritis glandularis the epithelium is often larger and often higher, and resembles cervical epithelium, but the nucleus is always central. Hypertrophy of glands does not lead to much thickening of mucosa. Hyperplasia leads to thickening of mucosa and is most marked in fungoid endometritis, which is hyperplastic, glandular, ectatic.

At the menopause the endometrium becomes thin, the glands become smaller, the stroma undergoes atrophic changes. Small cysts may be present, for the epithelium is pale and becomes loosened from its wall, and finally spaces are present which are filled with cell detritus. On absorption of this cell detritus there remain only cell spaces. This normal change, occurring at the climacterium, may in some instances lead to the healing of a glandular hyperplastic endometritis.

SYMPTOMS

The symptoms associated with involvement of the endometrium are subjective or objective. The subjective symptoms associated with circulatory, nutritional, or inflammatory involvements of the endometrium are bleeding, pain, fluor, or combinations of these.

Subjective Signs.—For clinical reasons, therefore, endometritis has often been divided into *endometritis hemorrhagica*, *endometritis dysmenorrhœica*, and *endometritis catarrhalis*. Inasmuch as bleeding and pain may be due to conditions other than endometritis, and as fluor may come from the vagina or cervix, errors are readily made by the use of these terms which refer only to symptoms. On the other hand, certain forms of endometritis which have typical objective characteristics are called endometritis gonorrhœica when gonococci are found on examination, endometritis exfoliativa when endometrial membrane is thrown off at menstruation, and endometritis fungosa when examination by the sound shows an overgrown fungoid

lining in the uterus. For therapeutic reasons it is better to diagnose changes as either *non-inflammatory or inflammatory*, and to pay additional attention to objective symptoms in the examination of the uterus and its lining.

An obstacle to the proper understanding of the question of endometritis is due to the fact that to many endometritis always implies *hemorrhage*. In certain forms *bleeding* is a symptom. When menorrhagia is the only symptom, corroboration of the diagnosis of endometritis must be gained from an objective examination, and all other various possible causes of intrauterine bleeding must be taken into consideration and excluded. The bleeding which is a symptom of endometritis is generally a menorrhagia. Menorrhagia is much more frequent than metrorrhagia. It is noted that menstruation gradually becomes more profuse and the bleeding lasts for progressively longer periods, often for as much as ten or twelve days. Bleeding may occur, then, every two or three weeks, and at times may be intermenstrual, especially after exertion. Patients may bleed severely, the blood simply flowing away, and large clots may be passed. In many instances the patients recover slowly from the loss of blood and a chronic anemia not infrequently results. This menstrual bleeding implies conditions which increase and lengthen the congestive hyperemia, or conditions which do not curtail the hyperemia. Bleeding is most frequent with the glandular hyperplastic fungoid involvement of the endometrium. Such a non-inflammatory change is due to, and is associated with, congestion and hyperemia, and bleeding readily occurs. Coexisting with the changed endometrium are often subinvolution of the uterine wall, or degenerative or atonic changes in the uterine muscle, and fibrotic alterations of the uterine wall. These changes imply altered muscle and elastic fibers and a lack of uterine contractility or uterine atony. Such uteri fail to cut the menstrual hyperemia short and the overgrown mucosa lacks elasticity and control over the capillaries.

Bleeding may further occur with acute inflammatory infection of the tubes, of the parametrium, or of the perimetrium. This may be due to either marked uterine hyperemia or a uterine

inflammatory endometritis with hyperemia. The greater and the more intense the hemorrhage and the longer the hemorrhage lasts after inflammation about the uterus subsides, the more does the bleeding speak for an actual inflammatory involvement of the endometrium, and this is generally associated with involvement of the uterine wall and is accompanied by congestion produced by the periuterine inflammation or by periuterine exudates. Bleeding which occurs with chronic inflammation of the endometrium is usually due to involvement of the uterine wall, or to congestions produced by periuterine inflammation and exudates. Here, again, are conditions which increase and lengthen menstrual hyperemia; a lack of contractility and elastic power in the uterine wall causes prolongation of the hyperemia.

In the non-inflammatory hyperplastic forms of endometrial involvement, if bleeding is excessive, *pain* may accompany the first flow of blood, and is then due to the fact that the blood is poured out in large amounts and becomes clotted, so that marked contraction of the uterus is necessary to force it through the cervical canal. Here pain occurs with the expulsion of each clot. Through overgrowth of the mucosa at the internal os, or through inflammatory swelling of the cervico-uterine mucosa at the internal os, an acquired obstruction to the outflow of blood may cause dysmenorrhea, but acquired uterine pain is usually a symptom associated with an inflammatory involvement of the endometrium or of the uterine wall. It may begin eight days before menstruation, when the menstrual congestion first takes place. There is a feeling of pressure in the pelvis, a sensation of fullness and weight, a desire to go to stool, and a frequent desire for micturition; there is pain in the back and legs and the consciousness of the existence of a uterus. This group of symptoms is very frequently noted with those involvements of the endometrium which are inflammatory. The important characteristic of these pains is that they occur also at the menstrual period, or only at the menstrual period.

Uterine pain has the character of mild labor pains. There is also a sensation of pressure and bearing down. Pain is

generally felt in the suprapubic region, but not infrequently in the region of the umbilicus or near the ribs. It is frequently felt in the uterus a day or two before menstruation. The pains may occur between menstrual periods, and are then generally due to accumulation of secretion within the uterus. A point which speaks in favor of an inflammatory etiology is that this uterine pain first comes on after marriage. Any uterine dysmenorrhea which becomes worse after marriage, or which is first acquired after marriage, is, in the vast majority of cases, the result of an inflammation of the endometrium or of the uterine wall.

Bleeding and pain are symptoms which also belong to other conditions than inflammation, but *discharge or fluor* is almost a proof of infection. The discharge may be seropurulent or purulent, or, in chronic cases, it may be a thin watery fluid of purulent appearance. Often the secretion is very slight. The largest amount is observed in gonorrhea during pregnancy. Fluor has a tendency to increase before and after menstruation, but sometimes may stop entirely for varying periods. Mucoid fluor always indicates discharge from the cervix. Pure pus, if the vagina be excluded, comes from the uterus. It is necessary to distinguish, by the aid of the Schultze tampon, between secretion from the vagina and secretion coming from the cervix or uterus. Care must be taken in this test, for erosions stain the cotton a light yellow. In distinguishing between cervical and uterine discharge on the Schultze tampon, we may infer that if mucus and pus are well mixed, the combined secretion probably comes from the cervix. If pus and mucus are not mixed, and if there is much more pus than mucus, the corpus of the uterus is also involved. The absence upon the tampon of cervico-uterine secretion of a pathologic nature is no proof that fluor does not exist, and another examination should always be made before and after menstruation. Fluor or discharge is a frequent symptom of involvement of the endometrium, and, of course, when met with, indicates an inflammatory invasion of the uterine lining. It is most frequently associated with cases of gonorrheal origin, and is then especially marked during pregnancy. All stubborn uterine catarrhs

which persist after treatment are probably of gonorrheal origin, even if the gonococci cannot be found in the discharge and even if the uterine adnexa and the periuterine tissues are normal. It must be considered axiomatic, that simply the absence of gonococci on microscopic examination of a purulent or catarrhal uterine discharge never excludes gonorrhea.

Pre-menstrual Symptoms.—There may be a sensation of pressure or a feeling of swelling in the uro-genital tract. The patients seem conscious of the presence of a sensitive uterus There is a desire for frequent urination; there is a sensation of pressure in the rectum, and pain in the back and in the legs. These symptoms are related to menstruation and its associated congestion. There are other symptoms of a general nature. The patients are nervous or tired or excitable. They have a restlessness that is sometimes maniacal. There is palpitation of the heart; there is change of temperament, which is marked. They are mentally upset and changeable, sometimes melancholy. These symptoms are exaggerations of the complaints which even healthy women mention at this time. While such symptoms are not infrequently found without metritis and without inflammatory tubal and ovarian diseases, they occur most frequently in women suffering from catarrhal endometritis, in whom, be it said, metritic, tubal, and ovarian changes often escape detection on bimanual examination.

Objective Signs of Endometritis.—Examination of the uterine cavity by the sound often shows, with involvement of the endometrium, an enlarged cavity. (This may also be observed with uterine polyps, after abortion, with subinvolution, and with uterine atony.) The lining of the uterus may seem thick and soft; it may bleed on the use of the sound. Excrescences, when present, are most often felt in the fundus and tubal corners. The excrescences are most marked with the fungoid form of endometritis. The lining of the uterus may seem rough to the examining sound (also with carcinoma, retention of decidua, etc.). On the other hand, the endometrium when involved is often smooth, especially with the inflammatory atrophic forms, and even in some cases of the diffuse hyperplastic form. Fungoid endometrium bleeds easily

on the use of the sound. On the other hand, the introduction of this instrument is not infrequently accompanied by pain. As a rule, this symptom of pain on the use of the sound means an inflammatory involvement. (There are cases, however, in which the reaction of pain to the use of the sound is due to a hyperesthesic state.) The pain felt on the use of the sound may be noted in or near the umbilicus or the back, and this fact must be taken into consideration. If due to endometritis and not to perimetritic conditions, the pain is noted when the sound enters the uterus, and not when, by moving it, the uterus is also moved.

VARIETIES

Endometritis Fungosa.—Fungoid or hyperplastic glandular endometritis implies an overgrown mucous membrane. The change is of a glandular character and diffuse. Endometritis fungosa means endometrium so overgrown and thick that it projects above the surface. It feels thick and mossy to the sound and large amounts are obtained by the curet. If no interstitial changes occur, it is simply a *hyperplasia*, especially of the glands. It is in contrast to the purely interstitial forms, where atrophy is the rule. In the real hyperplastic non-inflammatory form the only symptom is menorrhagia. Dysmenorrhea and discharge are absent. The cavity of the uterus is enlarged and the use of the sound is not accompanied by pain. The use of the Schultze tampon shows no discharge. There is no parametritis, perimetritis, or tubal disease, and there are no other evidences of inflammation. There is usually a history of previous abortion or evidences of subinvolution are noted. This condition may be present in virgins as a result of over-stimulation by the ovarian secretion, or as a result of failure of trophic control over the endometrium by ovaries involved by the diseases of children. Displacements are a factor only if congestion is present, induced by poor circulation, subinvolution, etc., as is also the case with normally situated uteri. Since the uterine lining is a lymphoid tissue, it is quite possible that in the so-called lymphatic constitution the uterine lining may undergo hyperplastic changes as a part of a general condition of lymphatic hypertrophy. This may explain the

hyperplasia of the mucosa and menorrhagia present in young girls without apparent cause. In addition to the purely glandular form, we have a glandular and an interstitial, which means either inflammation superimposed on an endometrium involved in glandular hyperplasia or else the glandular hyperplasia is due to the congestion which is associated with an active inflammation of so acute or deep a nature as to involve the uterine wall or the adnexa or the periuterine vessels, and so cause a permanent congestion in the uterine lining. Congestion is the important element in the production of *hyperplasia of the endometrium.* The endometrium often feels rough to the sound and excrescences may be felt.

Sapremic Endometritis.—There may be a saprophytic involvement of the uterine lining by bacilli, by bacteria, by cocci, and the proteus vulgaris, which grow on dead material represented by placenta, decidua, degenerating tumors, carcinoma, etc. In puerperal endometritis Krönig examined one hundred and seventy-nine cases; fifty were due to saprogenic bacteria, generally cocci, the so-called putrefactive bacteria. They do not grow on healthy tissue or in the blood. Krönig never found them with streptococci or staphylococci. In the putrid form of endometritis the necrotic tissue is separated from healthy tissue by granulation. The necrotic area is thrown off, the round cells are absorbed and normal mucosa returns. The discharge is foul-smelling. Temperature and rapid pulse are present. The condition is an intoxication by the toxins produced by the saprophytic bacteria. These do not grow on living tissue.

Septic Endometritis.—Acute septic endometritis is characterized by fever, discharge, and other evidences of pelvic inflammation, and occurs after abortion, labor, operations, curettings, and intrauterine manipulations. The earlier the onset of fever and pain, the more severe it is. The deeper in to the uterine wall the affection extends, the more severe it is. If it is limited to the mucous membrane, even if streptococci are found in the lochia, there is euphoria. The pain comes on with involvement of the peritoneum or parametrium. There is a purulent discharge which has no odor unless saprophytes are present.

The course is simple if limited by granulations under the decidua. The course is severe if the infection extends deeply into the uterus, into the lymph-spaces, into the lymph-spaces of the parametrium, or if there is thrombophlebitis or if the general circulation is involved. Among the changes occurring in the uterine wall are either metritis dissecans, intramural abscess, or chronic metritis. Infection by the gonococcus must be excluded by repeated examination.

Gonorrheal Endometritis.—The infiltration occurring in this inflammation is often observed only in isolated areas and mostly around the glands. There is often an added exudative inflammation. The surface epithelium is gone in many places and the glands show inflammatory growth. The mucosa is thickened, the surface is rough, and there are small overgrowths. There is a marked interstitial inflammation with very great pus and round-celled infiltration. There is a purulent secretion. Its irritating action causes burning, ulceration, secondary changes, and soreness in the vulva. If it invades the uterine wall, there is acute metritis. The uterus is enlarged and sensitive. The portio is swollen. There is a sensation of weight and pain in the pelvis. There is a vaginitis granulosa and a papillitis.

In younger women or in women with tender epithelium and in pregnant women the term gonorrheal endometritis is used, in contradistinction to the term catarrhal endometritis, when the examination of the uterine discharge gives positive evidences of the presence of gonococci. Here the process is one which is fresh or still active, and is often, unfortunately, kept active by intrauterine treatment. Very frequently there is a deeper involvement than in the ordinary superficial infection. There are many cases where the inflammation is superficial, has become quiescent, and restoration to the normal is beginning. No gonococci can be found, but, in addition to pus cells and epithelial cells, squamous cells may be present. To this form, of necessity, the term catarrhal endometritis is given. In endometritis gonorrhœica the gonococci have been found or are still found. The affection of the endometrium, then, in many cases is of secondary importance, for there are complicating

conditions, such as salpingitis, pyosalpinx, parametritis, peritoneal and ovarian involvements. In such cases gonococci may be found for weeks and months in the uterine discharge. The symptoms of the acute stage are those of a mild or diffuse pelvic peritonitis and the periuterine symptoms dominate the situation.

Catarrhal Endometritis.—This is characterized by hyperemia and infiltration. There is a secretion of a seropurulent character. There are pre-menstrual symptoms. Menorrhagia is rare. Dysmenorrhea, in the superficial involvement of the endometrium, is seldom a symptom, but is more marked with the deeper involvements of the mucosa or with involvements of the uterine wall. There are no excrescences, no pain from the sound, with *superficial involvement.* The Schultze tampons should be used and are necessary for diagnosis. Periuterine alterations should always be looked for, and are frequently found on repeated examination or on examination under narcosis. It cannot be denied that a catarrhal endometritis may be due to non-virulent streptococci, staphylococci, bacterium coli, or to saprophytes. There may result an inflammation of a subacute form, subsequent to an acute septic process. In other cases it is possible that these bacteria from the beginning have been of a mild saprophytic type. It is the natural tendency to incline to this view and to exclude the gonococcus as an etiologic factor when repeated examinations disclose no gonococci, and especially if the periuterine structures seem normal. I believe, however, that most of the persistent uterine catarrhs, except such as follow acute septic infection, and those that come on at or after menopause or on the retention of fetal tissues, especially if they resist conservative treatment, are originally gonorrheal in their etiology, even if no gonococci are present. I therefore believe that the vast majority of cases of catarrhal endometritis before the climacteric period are to be referred to mild superficial gonorrheal infection, by supposed or objectively cured diseases of the prostate.

Endometritis Dysmenorrhœica.—If accompanied by menorrhagia and fluor, attention is immediately directed to the endometrium. This condition may be present without men-

orrhagia, but is often accompanied by fluor. Sometimes there is neither hemorrhage nor fluor, but only nervous symptoms. Endometritis dysmenorrhœica is that form in which there is an interstitial exudation, but the objective evidences of inflammation are not so marked as in the other inflammatory forms. Menstruation is painful and the use of the sound causes pain. The discomfort felt in this condition is to be attributed to the exudative process. It is probable that many of these cases are simply the inflammatory form with a minimal amount of discharge. Endometritis dysmenorrhœica, as a rule, implies inflammation.

Senile Endometritis.—Beyond the climacterium occurs an endometritis accompanied by bleeding and disagreeable fluor, symptoms which resemble carcinoma. A non-resistant endometrium permits the growth of saprophytic bacteria, and the condition is comparable to the vaginal state in senile vaginitis of older women.

Endometritis deciduæ is an inflammation of the endometrium occurring during pregnancy, and producing symptoms which are most marked in the first half of pregnancy. The symptoms are fluor, bleeding, and pain. The bleeding begins early and may last for weeks or months. The blood is mixed with mucus. The discharge is purulent, especially if gonorrheal. It is sometimes watery, furnishing the form known as hydrorrhœa uteri gravidi. The Schultze tampon should be used. Pain is frequently present, its character resembles uterine contractions and it may last for months. This primary condition often gives symptoms before pregnancy, and abortions are frequent. The expelled particles, when examined, show inflammatory changes.

Membranous Endometritis.—Membranes thrown out by the uterus are (1) unorganized, *i. e.*, fibrin membranes thrown out with symptoms of dysmenorrhea; (2) organized membranes expelled with dysmenorrhea and representing larger or smaller parts of altered uterine mucosa. They are smooth on their inner surface and show the openings of the glands. On the external surface where they are torn off they are irregular. They give the general picture of interstitial exudative endome-

tritis with small round-celled infiltration. Sometimes we get a picture of combined interstitial and glandular increase. In the more severe forms where the uterine lining is thrown off in the form of a membrane, inflammatory evidences by the microscope are also present, and it is probably well to consider all these changes as the result of bacterial involvement either during childhood or at a subsequent stage. The exudative swelling is the probable cause of expulsive efforts on the part of the uterus. There are generally small round cells present. There are sometimes large cells, which look like decidual cells. It is then hard to distinguish from the decidua of pregnancy, but the change in this membrane is not so regular as in decidua and the framework between the cells is not so homogeneous; it is finely fibrous and loose and the glands are generally compressed. Dysmenorrhea membranacea is rarely regarded as an entity now; the condition to which this name was formerly applied has been recognized as simply an expulsion of decidua after abortion or during ectopic gestation. The real cases are those that at every menstrual period throw off with marked pain a membrane of the character of uterine mucosa altered by inflammation. This condition is difficult to cure and curettage must be done.

SEQUELÆ

The results of disease of the endometrium take various forms. If there is abnormal secretion it may have a bearing on the location of the ovum, if it be embedded at all. Alterations in the character of the endometrium are probably responsible for that embedding of the ovum in the lower end of the uterus which results in placenta prævia. If the endometrium, as the result of chronic inflammation, is smooth and atrophic, it cannot readily accommodate the embedding of the ovum, or else the change to decidua is not a normal one. Therefore disease of the endometrium may prevent conception, may prevent embedding, may be the cause of sterility or the cause of habitual abortion. Sterility is frequently the result of the inflammatory atrophic form. The most frequent involvements of the endometrium are those associated with discharge and dysmenorrhea. With the chronic hyperplastic form in which

bleeding is so frequently a symptom, sterility is not the usual result. Here, because of the congestive hyperemia and easily induced bleeding, single and repeated abortions at an early stage usually occur.

TREATMENT

The treatment of acute septic endometritis demands rest in bed, fluid diet, attention to the bowels, and the usual sustaining and antipyretic treatment associated with pelvic inflammation. An ice-bag or ice-coil should be applied to the abdomen and short, very hot vaginal douches of ½ per cent. lysol or 2 per cent. mercurochrome 220, given several times a day. The local treatment consists of very gentle intrauterine douches given with a double-running irrigator. These douches may consist of 1 per cent. lysol; iodin, one dram of the tincture to 2 quarts of water; or of dilute acetic acid, 2 ounces to each quart of water. Internally the use of fluidextract of ergot 30 minims, or, better still, of ergotol 15 minims, or of ergotin 2 grains, from four to six times daily, is advisable to contract the uterine wall and to prevent or limit by this means the rapid extension of the invading micro-organisms into the lymphatics of the uterine wall. When a septic endometritis spreads out and involves the parametrium or the tubes, or the peritoneum or the general circulation, the condition is no longer an endometritis and surgical considerations are often imperative.

The treatment of sapremic endometritis demands removal by the dull curet or by the finger of adherent necrotic fetal or placental tissues.

The treatment of acute gonorrheal endometritis includes rest in bed, fluid diet, and daily short hot douches of iodine, or oxycyanide of mercury 1:10,000 to 1:5000, alternating with hot douches of ½ per cent. acetate of aluminum several times a day. The ice-bag should be applied to the abdomen or the ice-coil used. The associated vulvitis or urethritis or other complications must be treated according to the methods explained under those headings (see Gonorrhea). A very long period of rest in bed is essential and the patient should not be permitted to get up until she has been free of temperature for at least two weeks. With every acute gonorrheal endometritis

there is associated more or less metritis and, in the vast majority of cases, extension to the connective tissue, tubes, or peritoneum. Long continuation of pyrexia with great pain and distention, etc., suggest peritoneal involvement. With high temperature and marked pain, repeated careful local examination is essential, for connective-tissue, tubal, and peritoneal complications may demand surgical intervention.

The treatment of chronic gonorrheal endometritis is given in the section on Gonorrhea (p. 600).

In "endometritis" we are dealing with a uterine lining, altered in character and structure, sometimes associated with atrophy of the mucosa, ofttimes with hyperplasia of the mucosa, and evidencing either inflammatory changes or no inflammatory changes. There is in many cases a uterine cavity larger and more roomy than normal. Intimately associated with these alterations of the mucosa are changes in the character of the uterine wall. The uterine wall may be altered as a result of inflammation. Without inflammation the uterine wall may be thickened and congested, or it may be thickened as a result of hypertrophy of the muscle fibers or increased growth of the fibrous connective tissue or change of the elastic fibers to fibrous bundles. The capillaries and blood-vessels of the mucosa may be dilated and greatly increased in number, the vessels of the uterine wall may be congested or dilated, and there frequently exists about the uterus dilated arteries and veins, or else changes of an inflammatory nature are present.

The treatment of endometritis depends upon the cause, upon the symptoms, and on the desired result. The medical treatment of hyperplastic endometritis is directed to the treatment of the menorrhagia or the metrorrhagia. It implies the use of ergot, ergotol, or ergotin, of hydrastis or hydrastinin hydrochlorate, of stypticin, styptol, of suprarenal extract, adrenalin, or mammary extract and the hot-water bag applied to the lower vertebræ. Irregular bleedings which occur if decidua is left behind after abortion, and bleedings which occur on the presence of overgrown or polypoid endometrium or which continue after the medical treatment of hyperplastic endometritis, demand the use of the curet.

In dealing with a hyperplastic endometrium whose only symptom is bleeding, the use of internal remedies, the best of which is stypticin can be tried. Stypticin should be given in doses of 2 to 4 grains several times a day, beginning two or three days before menstruation, and continued during menstruation. A very good combination consists of ergotin 2½ grains, stypticin 2½ grains, and suprarenal extract 2½ grains in capsules, given four to six times a day. Between menstruation, especially if the uterus is enlarged or the cavity is enlarged, ergotol 15 minims, and fluidextract of hydrastis 15 minims, should be given four times a day. A regular course of sitz-baths 70° to 85°, five to fifteen minutes is valuable. In cases in which the loss of blood is very marked, or in which the menorrhagia goes over into metrorrhagia or irregular bleedings, curetting must be done. (See Uterine Bleeding.)

With endometrial hyperplasia there often comes a time when the curet is necessary. The use of the curet may be followed later on by the application of 10 to 20 per cent. chlorid of zinc, or 10 to 20 per cent. pure tincture of iodin or 50 per cent. carbolic alcohol. Care should be used in introducing these fluids into the uterus, for they may pass into the tubes. It is better to use cotton rolled on a screw-tip applicator or to introduce into the uterus a syringe with its tip covered with cotton, and then to inject the fluid slowly so as to moisten the cotton covering. Even curetting fails to cure the bleeding in a certain proportion of cases. The use of intrauterine medicated suppositories is dangerous if cauterizing drugs are used, because of the possibility of causing a stenosis.

An inflammatory endometritis not associated with severe bleeding should not be curetted. It is wisest to treat these cases without intrauterine manipulation. Some treat them, however, by dilatation of the cervix with Hegar dilators or intrauterine electrodes and the negative pole of the galvanic current, and daily intrauterine irrigations with 1 per cent. lysol, 1 to 2 per cent. carbolic, or ½ ounce of Lugol's solution to the quart. These irrigations are carried out two or three times a week. Later on, with a wide cervical canal the uterus may be irrigated and tincture of iodin, or 5 to 10 per cent.

chlorid of zinc may be applied. In other instances medicated sticks containing 10 per cent. iodoform or 2 to 5 per cent. protargol may be introduced into the uterus two or three times a week.

Many conditions are mistaken for endometritis which are really nothing more than natural changes produced by premenstrual congestion. When the mucosa is chronically congested in association with descent or displacement of the uterus, or through inflammation in the adnexa, or through primary endometritis, overnourishment of the glands may lead to their hypertrophy. Excess of function results in the increase of discharge, which is thus one of the most constant signs of inflammatory endometritis. The menstrual flow may come on earlier and last longer than normally and may become irregular. Even if curetting results in a temporary improvement, the condition recurs so long as the congestion and inflammation persist, especially if the congestion or inflammation has at the same time altered the character and structure of the muscular wall.

My usual method of treatment for these cases is the use of glycerin in the vagina, well applied with the aid of gauze. A very good aid consists in the use of daily vaginal douches of several quarts of cold water, beginning first with tepid and gradually cooling it down in the course of weeks. When continued for weeks, they have an excellent effect on the uterus. In the treatment of acute and subacute gonorrhea, although some dilate the cervix and make use of the above method, it is wiser to use no intrauterine treatment. Every stubborn uterine catarrh which resists conservative treatment is possibly gonorrheal. We then depend on the use of cold douche applications, the administration of sitz-baths to produce temporary hyperemia, use of tonics, and such an arrangement of the patient's routine as will prevent congestion. (See also pages 601, 602, 603, 604.)

For the treatment of pre-menstrual symptoms bromids are useful, given in the dose of 10 grains of strontium bromid in water four to six times a day. In extremely excitable cases hyoscin hydrobromate, $\frac{1}{200}$ of a grain, may be given three times a day. Its effects should be watched, as some patients

are extremely susceptible to the drug. For the treatment of *pain* see Dysmenorrhea.

For senile endometritis intrauterine irrigations with lysol solution or 1 to 2 per cent. carbolic acid, and treatment of the associated vaginitis with pyroligneous acid, should be carried out.

For endometritis membranacea the internal administration of ovarin and iodid of potash should be continued for a long time. For the pain experienced at menstruation the drugs mentioned under dysmenorrhea should be used. A thorough curetting is the best form of treatment for endometritis membranacea.

INFLAMMATORY METRITIS

1. Bacteria may thrive in the uterine cavity in puerperal affections, after operations or induced abortions.

2. The introduction of pyogenic bacteria into the uterus in non-puerperal conditions may produce acute infection, if at the same time there is an injury to the endometrium.

3. Gonococci can grow in the healthy tissue of the endometrium, though their activity is increased by curettage, labor, and especially by abortion.

Acute Endometritis after Labor, etc.—The course of an acute endometritis occurring after labor, after operations, after the use of the curet, or subsequent to abortions may be limited and held within bounds by granulations in the endometrium or the decidua. There may, however, result deeper involvement, producing intramural abscesses or numerous miliary foci or chronic diffuse metritis.

Septic pyogenic endometritis is due to streptococci, staphylococci, and the bacterium coli. Involvement may be superficial. It is characterized by round-celled infiltration. A granulation area is formed under the necrotic tissue. If the granulation area is dense enough, there is no deep invasion. Otherwise the septic involvement extends into the muscularis. When recovery takes place there is formed intramuscular connective tissue and induration results.

Gonorrheal Involvement of the Endometrium.—Gonorrheal involvement of the endometrium is characterized in the acute stage by an interstitial involvement with small-celled infiltration. The glands are filled with secretion and epithelia and the interstitial tissue consists of closely grouped small cells and round cells and smaller round pus cells. Madlener found gonococci in the infiltration foci of the muscularis, which proves that the muscular changes are not due to the bacteria or cocci of a mixed infection. If gonococci are in the uterus, according to Wertheim, they may invade the uterine wall and

cause an acute metritis with enlarged uterus, sensitive uterus, red swollen portio, pain and weight in the pelvis, erosions of the cervix, and granular vaginitis. Chronic metritis may be the result of acute cases as above, in which event there is a history of such a condition. Gonorrheal endometritis post partum often causes few symptoms, and the rise of temperature associated with it is slight. Krönig examined one hundred and seventy-nine cases of puerperal endometritis and found gonococci in the lochia of fifty. Wertheim took five cases of fresh gonorrhea in whom the adnexa were normal and in whom there were no subjective symptoms of an affection of the endometrium. He curetted particles from the corpus mucosa, examined the sections, and found gonococci in them all. Chronic metritis may result from a process which was never acute.

Wertheim finds that the uterus in chronic gonorrhea is enlarged, the wall is thickened and hard, and the mucosa is thickened to 5 mm. Microscopically there is a great infiltration by pus and round cells, either diffuse or in spots around the glands. There is edema of the interstitial tissue.

Inflammation in the Connective Tissue and in the Muscularis.—Inflammation occurs in the connective tissue between the muscle bundles. Such inflammation comes from the endometrium. In acute inflammation there is an accumulation of leukocytes. The muscle bundles are forced apart by serous exudation and a doughy swelling of the uterus results. Chronic inflammation leads to the development of connective tissue between the muscle fibers, which then gradually become atrophied. The uterine wall is finally much thickened by connective tissue and forms a hard mass. An important consequence is lack of contractile power of muscle fibers and the presence of an excessive amount of connective tissue. Such conditions complicate very many cases of endometritis, gonorrheal and catarrhal, and are more responsible for the symptoms and annoyances than are the changes in the endometrium.

In every case of inflammatory metritis we have an associated inflammatory endometritis. In other words, with many cases of endometritis the uterus is so involved as to constitute a metro-endometritis. The very fact that an acute involvement

extends into the muscularis makes the acute disease more serious and protracted and renders a chronic condition less amenable to restoration to the normal. In addition to the fluor and pain of a chronic inflammatory endometritis, there is such an alteration of the muscular wall as renders menstruation more profuse, of longer duration, and often of an irregular character.

There is a feeling of weight in the pelvis, the portio is thickened and the uterus is enlarged. There are erosions, hypersecretion, uterine fluor, irregular bleedings, either menorrhagia or metrorrhagia, especially in the cases which were previously acute.

TREATMENT OF METRITIS

The treatment of acute metritis is like that of acute endometritis, but more prolonged. Rest in bed, the use of the ice-bag or the ice-coil, fluid diet, attention to the bowels, the usual sustaining and antipyretic treatment. Short hot vaginal douches should be made use of several times a day and should consist of 1:10,000 or 1:5000 oxycyanid of mercury or ½ to 1 per cent. lysol. With most careful precautions there may be given daily one or two intrauterine irrigations with a double-running catheter in post-partum or abortion cases. These irrigations may consist of very mild solutions of iodin, or very weak carbolic acid solution, but best of all is 1 per cent. lysol, or dilute acetic acid 2 ounces to each quart of water. Internally ergotol 15 minims or ergotin 2 grains should be given four to six times a day. This treatment applies to septic metritis and not to gonorrheal metritis, unless the latter is post partum.

The treatment of gonorrheal metritis is rest in bed, the use of vaginal douches, etc., as prescribed under gonorrheal endometritis. Because of its importance, repetition of the essential points is justified.

The treatment of acute gonorrheal metro-endometritis demands rest in bed, fluid diet, and short hot douches of oxycyanide of mercury 1:10,000 to 1:5000, or 1 per cent. mercurochrome 220, alternating with short hot douches of ½ per cent. acetate of aluminum several times a day. The

ice-bag should be applied to the abdomen or the ice-coil used. The associated vulvitis or urethritis or other complications should be treated according to the methods explained under those headings (see Gonorrhea). A very long period of rest in bed is essential and the patient should not be permitted to get up until the temperature has been normal for at least two weeks. With every acute gonorrheal endometritis there is associated more or less metritis, and in the vast majority of cases there is extension to the connective tissue, tubes or peritoneum. Long continuation of pyrexia, with great pain and distention, etc., indicate peritoneal involvement. With high temperature and marked pain, repeated careful local examination is essential, for the connective tissue, tubal and peritoneal complications may later on demand surgical intervention.

In the treatment of chronic metritis the patient should lead a life free of effort, and lifting and all physical strain should be avoided. Coitus and other factors which increase the congestion must be eliminated. Daily douches should be taken of several quarts of hot water, making use of oxycyanid of mercury 1 : 10,000 to 1 : 5000 or lysol ½ per cent. or some of the astringent powders, such as alum, or tannic acid or sulphate of zinc 1 dram to each quart of water. The associated erosions should be treated by a direct application of carbolic acid, followed by the application of tincture of iodin, as described in the section on Cervical Catarrh. For the uterine congestion and inflammation glycerin treatment is the best. This is carried out by the use of glycerin (boroglycerin or 5 to 10 per cent. ichthyol-glycerin being used). Glycerin acts well when applied in large amounts. It is used as follows: With the bivalve speculum in place, and after cleansing of the fornices and the treatment of the erosions, 1 or 2 ounces of the glycerin is poured into the vagina, and then a long strip of sterile gauze, 6 to 8 inches wide and a yard long, is thoroughly packed first into the posterior fornix and then into the other fornices and then into the vagina, after which the speculum is removed. This is allowed to remain in place for twenty-four hours, during which time the patient wears a vulvar pad, for the amount of fluid extracted by the glycerin is large. The strip of gauze is

removed at the end of twenty-four hours and its removal followed by a douche of one of the above-mentioned drugs or by a vaginal douche containing a dram of acetate of aluminum to each quart of water. This application of glycerin should be repeated three times a week, and the hot vaginal douches should be taken twice every day, except during the twenty-four hours when the gauze is in place.

Rest in bed during menstruation is essential, and short hot douches should be ordered during menstruation.

For the bleeding, stypticin, 2 grains in capsules four to six times a day, is prescribed, best begun two or three days before the bleeding is expected, if the time can be gaged. With the stypticin, 2 grains of ergotin and 2 grains of suprarenal extract may be combined. Between menstrual periods ergotol, 15 minims four times a day, should be given, or ergotin 2 grains, plus hydrastinin hydrochlorate ½ grain, in capsules four times a day. Curetting must not be attempted in metritis unless the bleedings are so profuse as to endanger the patient's health. Curetting may then be followed by the use of steam, in the manner explained in the section on Atmocausis.

In the treatment of chronic metritis (due to bacteria), associated with congestion, infiltration, edema, but before the formation of new connective tissue and sclerosis, heat is used only if there is no pus about the uterus. Hot Priessnitz bandages, hot coil, hot-water bags, warm sitz-baths, hot vaginal douches are useful. In the late stages, when sclerotic changes are prominent and menorrhagia and metrorrhagia are marked, sitz-baths and douches which produce pelvic anemia are substituted, and scarification with suction may be used. If there is no metrorrhagia or menorrhagia Nauheim baths with an after-cure are advisable.

Inasmuch as the treatment of chronic metritis implies also the treatment of chronic catarrhal or gonorrheal endometritis, it is well to state that some treat these conditions by intrauterine applications or irrigations. Hence the reader is referred, in this connection, to the treatment of chronic gonorrhea as made use of by Bumm, Boldt and others, in the section on Chronic Gonorrhea (pages 601, 602, 603, 604).

Cases of chronic metritis are eventually, but not temporarily, relieved of the sense of weight and discomfort in the pelvis and of the pain experienced between menstruation by the use of sitz-baths containing 2 to 3 pounds of sea salt and 3 to 4 ounces of calcium chlorid taken for a period of fifteen to twenty minutes before retiring at a temperature of 90°. In place of the bath, the abdomen may be covered all night with a wet cloth over which oiled silk and chamois is applied, and kept in place by an abdominal binder of muslin, or a long, wide towel, or Neptune's girdle may be used.

The full Nauheim baths are often of marked benefit in the cases without bleedings, having the same local effect as sitz-baths, coupled with which is the general systemic benefit due to their action.

The menstrual pain associated with menstruation is treated by benzyl benzoate, the coal-tar products, etc., as described in the section on Dysmenorrhea (p. 302).

Point of Origin of the Infection.—The cervical portion of the uterus in particular is embedded in and surrounded by a large amount of cellular connective tissue. This connective tissue

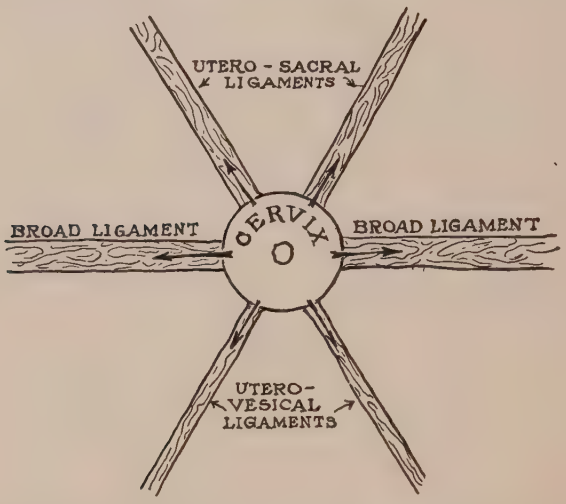


Fig. 133.—The parametrium. The cervix is surrounded by and embedded in a large amount of cellular connective tissue, which spreads out in the form of a six-pointed star. Each arm is covered by peritoneum, and contains muscle fibers, blood vessels, and lymphatics. This diagram illustrates the reason for early extension of inflammatory and malignant involvements of the cervix into the parametrium.

spreads out in the form of a six-pointed star. Each arm is covered by peritoneum and contains muscle fibers, blood-vessels, and lymphatics. Thus are formed the two broad ligaments, the two antero-lateral or uterovesical ligaments, and the two postero-lateral folds of Douglas or uterosacral ligaments. The base of the broad ligaments, called the ligamentum cardinale, is particularly rich in lymphatics. The cellular tissue posterior to the cervix, lying above the posterior fornix of the vagina and underneath the peritoneum of the cul-de-sac of Douglas, is also rich in lymphatics. The pelvis, underneath the peritoneum, is

lined with connective tissue; the cellular connective tissue of the pelvis. It is in direct connection with the connective tissue of the six ligaments united with the cervix. To the connective tissue of the six-pointed star, in particular, is given the name parametrium, and a further designation is added by the terms lateralis, anterior and posterior. The cellular connective tissue of the upper part of the broad ligament and along the tube and near the ovary, together with the great plexus of veins, is of the greatest importance because of its frequent and often unrecognized involvement in inflammatory processes.

Acute Cellulitis.—Pelvic cellulitis or parametritis is an acute, subacute, or chronic inflammation affecting the connective tissue under the peritoneum of the pelvis, but more especially involving the connective tissue situated in the broad ligaments (ligamenta lata), the vesico-uterine ligaments, or the utero-sacral ligaments, the latter also being known as the folds of Douglas. An acute parametritis is a phlegmon originating from an infected wound in the cervix. In acute parametritis streptococci are most frequently found, but staphylococci, bacterium coli, and the proteus vulgaris are also responsible for it, and so is the gonococcus, the latter, as a rule, in association with other bacteria. Inflammation of the connective tissue of the pelvis readily occurs, because of the numerous lymphatics present in the parametrium surrounding and connected with the uterus and cervix. In the acute form the broad ligaments are easily involved because of the lateral tears occurring in labor, and symptoms are manifested between the second and the eighth day. Injuries of like character may occur at operation on the cervix, especially when dilatation of the canal opens up the same avenues of approach. The uterosacral ligaments and the posterior parametrium are also invaded post partum and after abortion, but usually manifest symptoms at a somewhat later period. The most severe forms of parametritis are the acute phlegmonous inflammations combined with extension into the peritoneum. A more frequent form is acute phlegmon without involvement of the peritoneum. It is characterized by sero-gelatinous, yellow, infiltrating exudate and by small round-celled infiltration.

The Puerperal Form.—As stated, the early puerperal form often involves the ligamentum latum and is associated with tenderness and some pain in one side, with elevation of temperature. There is soft elastic exudation with edema in its periphery, situated lateral to the uterus. There results after a few days a large mass at the side of the uterus, extending high up into the broad ligament and over toward the pelvic wall. Since it is limited by the peritoneum of the broad ligament, its upper surface is rounded. Another frequent location is posterior to the cervix, that is, retrouterine and retrocervical, in which event the exudate also surrounds the rectum and extends into the rectovaginal septum. In this form the upper surface of the exudation may be round, when covered by the peritoneum of the sac of Douglas. If connected with the vagina, there is evidenced a flat infiltration underneath the mucosa of the posterior wall, ending on the posterior wall with a sharp edge.

Location of the Exudate.—A parametritic exudate may extend up on the anterior abdominal wall above Poupart's ligament, and may pass around the bladder and up on the anterior abdominal wall. The inguinal glands may be enlarged. The exudate may surround the uterus and the rectum in addition to lining the pelvis. The basic lesions are lymphangitis and venous thrombosis.

Acute parametritis in the broad ligament shows a swelling lateral to the uterus, extending from the uterus up to the pelvic wall. If it does not extend entirely up to the pelvic wall, it is slightly movable; otherwise, not so much so. It may be irregular at its lower border, and when pus formation occurs it may project into the lateral fornix. The upper border is found and readily felt by the external hand, extending in some cases up to the level of the umbilicus. When slight peritonitis is combined, the upper border may be indefinite through adhesion of intestines. The presence of pus is marked by higher temperature, chilly feelings or chills, and by evening rises and morning remissions. If no suppuration takes place, there is pyrexia, but otherwise relatively little discomfort.

Differential Diagnosis.—When an exudate is situated elsewhere than in the broad ligament or retrocervically, there is

formed a diffuse infiltration with many irregular extensions. When an exudate becomes smaller, the uterus resumes its normal position, the mass grows constantly harder, and most of it may be left close to the lateral pelvic wall. If so located, the exudation is of a flat form, and when its connection with the cervix is lost may produce independent flat tumors situated on the posterior or lateral pelvic wall.

There is some difficulty in diagnosing acute posterior parametritis in its retrouterine and retrocervical location, from a peritoneal exudate. Posterior parametritis is situated under the Douglas peritoneum, extends further down, is nearer the vagina, and may extend into the rectovaginal septum, even halfway down toward the vulva. It has a sharp lower end and is not movable. It may extend far laterally and may surround the rectum like a ring, making its lumen smaller, as may be found on rectal examination. On rectal examination the mucosa is not movable. A posterior parametritic exudate soon becomes hard, and when it does extend upward is round on its upper surface through limitation by the Douglas peritoneum, and only extends up a certain distance on the posterior wall of the uterus. It must be distinguished from a peritoneal exudate in the cul-de-sac of Douglas. The latter is somewhat movable. Its lower edge is round or oval or sharply outlined by the shape of the cul-de-sac of Douglas. It does not extend far laterally. It pushes the rectum to one side, as may be found on rectal examination. It may extend up on the posterior uterine wall to the fundus. It is relatively soft and cystic.

Symptoms.—In the early stages, a parametritic exudate is soft and elastic. The symptoms are often relatively slight and the patient has but little pain. The formation of pus is characterized by high temperature and marked remissions. The pus may be foul, in which case the prognosis is worse. The pus may rupture spontaneously above Poupart's ligament or into the vagina, bladder, and rectum. When the exudate has become completely purulent, an incision should be made through the vagina, either into the broad ligament or into the posterior fornix. In some cases the exudate breaks down into pus only in certain spots and the process may be long-drawn-out, lasting

for weeks or months. The proportion of the exudates which go on to abscess formation is small. These are generally situated in the broad ligament or retrocervically. If no suppuration takes place, the exudate may be completely resorbed or may leave sclerotic tissue behind. When the early edema subsides the parametric exudate feels hard and grows constantly harder, producing pain and discomfort according to its situation.

Because of the hard character which parametritic exudates assume after the edema subsides, the older cases must be diagnosed from all hard tumors about the uterus. When situated in the broad ligaments or posterior to the cervix, they resemble in no slight degree fibroid tumors. In the broad ligaments a parametritic exudate may be firm like a fibroid, but it is more closely connected with the lateral wall of the uterus and often has inflammatory extensions, especially posteriorly into the vagina. Through the rectum a fibroid is felt to be round, while the parametritic under-surface is flat and situated close to the pelvic wall. A fibroid is movable, while a lateral parametritic exudate is somewhat movable only if it does not extend up to the lateral wall. The use of the sound shows the uterus elongated in fibroid.

A small lateral parametritic exudate may resemble pyosalpinx, and it is often hard to tell whether we are dealing with parametritis, pyosalpinx, or both. Pyosalpinx lies higher, nearer the fundus, while the parametritic exudate may lie deeper, generally in the lower part of the broad ligament. The latter is near the cervix, may extend into the lateral fornix, is flatter and more diffuse. When the parametritis constitutes a parasalpingitis a diagnosis from salpingitis is almost impossible.

Lateral parametritis may resemble hematoma of the broad ligament, but the latter is not so diffusely hard as is the exudate. Hematoma is more rounded and has fewer extensions.

When existing on the right side, a parametritis must be diagnosed from a perityphlitic exudate. The latter resembles those parametritic exudates in the broad ligament which have extended up toward the pelvic wall. In perityphlitis, however, there is a different history; the exudate is not connected with the uterus;

it lies near the cecum and projects out more toward the abdominal cavity.

Subacute Parametritis.—A subacute inflammation often occurs after labor or abortion, in many cases due to the presence of the gonococcus alone or associated with other bacteria or cocci, and frequently is not recognized. This condition causes symptoms in the second or third week after labor. The patients do not improve in health, they have pain in the back, and at examination there is found, in addition to evidences of cervical catarrh, ectropion, etc., an induration or infiltration behind the cervix. This form includes the posterior parametrium and the uterosacral ligaments. In fact, involvement of the cellular connective tissue without cervical lacerations usually occurs in the posterior parametrium. In the early stages examination of the posterior parametrium shows a hard, diffuse infiltration like a fibroid, or sensitive edematous folds of Douglas. Very frequently there occurs after labor, abortion, or curettage a mild paraoöphoritis or parasalpingitis involving the cellular tissue along the tube near the ovary and in the ligamentum infundibulopelvicum. It produces varicocele of the broad ligament. This condition, when sclerosis takes place, is productive of pain in the ovarian region which is affected by the position of the patient. Associated with alterations in the ovary it often produces ovarian acquired dysmenorrhea.

There is a chronic, slowly progressive inflammation of the connective tissue, accompanied by sclerosis and thickening which is known as parametritis retrahens. It is generally retrocervical, in the folds of Douglas, in the connective tissue under the Douglas peritoneum and surrounding the posterior fornix of the vagina. It may result from the above-mentioned subacute process post partum or after abortion, which has originally produced a hard, diffuse infiltration behind the cervix and which has caused symptoms. It results from progressive infection of the connective tissue by a chronic cervical catarrh. In the early weeks after labor or abortion the posterior parametrium and the folds of Douglas may be extremely sensitive. This stage soon subsides and there results a progressive sclerosis and shortening of the uterosacral ligaments. The only symp-

toms are backache and the subjective and objective symptoms of a cervical catarrh. In the course of years the latter undergoes improvement, and all that is finally seen is a sclerosed posterior parametrium.

Parametritis retrahens is found in nulliparæ, but is most common in the women who have borne one or more children. Cervical catarrh seems to have a predilection for extension into the posterior parametrium. It does not produce an acute swelling or pus, but manifests itself by an edematous infiltration which causes at first elongated, sensitive uterosacral ligaments, and so permits the cervix to descend and often allows a bulging into the vagina of the posterior roof or fornix. In nulliparæ it simply forms a slow progressive infiltration of the posterior, cellular connective tissue. The end-result is the formation, on one side or both, of a shortened sclerotic uterosacral ligament with consequent limitation of mobility of the cervix and the production of a retrodisplacement with backache.

Parametritis Atrophicans Diffusa.—There is a parametritis of more general nature which is called parametritis chronica atrophicans diffusa (Freund), with which there is associated great atrophy of all the pelvic organs with early menopause and marked nervous symptoms.

Diagnosis.—If chronic or subacute parametritis involves the broad ligament, there is felt just above the fornix in the base of the broad ligament a sclerotic retracting band. The diagnosis is not difficult if the sclerosis is situated in the broad ligament, for the infiltration lateral to the uterus is easily palpated. It is situated just above the lateral fornix in the base of the broadligament. If the cellular tissue in the upper part of the broad ligament and the ligamentum infundibulopelvicum are involved there results a paraoöphoritis, often with the symptoms of ovarian dysmenorrhea.

When the fingers are passed high up into the posterior fornix in a case of posterior parametritis the normal elasticity is gone and the manipulation causes pain. An attempt to push the cervix up toward the symphysis discloses lack of mobility of the cervix. The sclerotic uterosacral ligaments are felt and pain is produced, often noted in the back and in the rectum. Exami-

nation per rectum discloses the same condition and infiltration about it is noted. Parametritis must be differentiated from perimetritic adhesions, though the combination of the two is frequent. The diagnosis is sometimes difficult. In the case of posterior parametritis we have two thick bands, representing the folds of Douglas, which pass out from the uterus at the level of the cervix, diverging externally and posteriorly. The space between the two is frequently thickened and banded. The uterus is often retrodisplaced. Mobility of the cervix is limited. Backache is a frequent symptom and is aggravated by examination. Perimetritic bands are to be diagnosed if we feel strands passing off from the fundus or from the whole posterior wall of the uterus, or if the ovaries are fixed. More than two bands exclude the uterosacral ligaments alone.

TREATMENT OF PARAMETRITIS

Not every acute parametritis ends in pus formation. Therapy consists in aiding resorption and, if this proves unsuccessful, in promoting suppuration, which is relieved by vaginal incision. Resorption occurs more frequently with post-partum exudates other than gonorrheal. The treatment of acute and subacute stages of parametritis is the same as that of acute and subacute salpingo-oöphoritis. I have often seen cases of parametritis after abortion and labor, particularly those coming on from ten days to two or three weeks after labor, heal and undergo resorption after weeks, and sometimes months, of conservative treatment. The exudate is gelatinous or hard; it is diffuse. It gives no evidence to the touch of breaking down into pus and is not associated with high temperature reactions. There is a minimum amount or else an absence of peritoneal irritation. However, such cases of parametritis posterior, or especially lateralis, as are associated with high temperature reactions and evidences of marked peritoneal irritation are usually those that represent a combination of parametritis with salpingo-oöphoritis and pelvic peritonitis. The size of the adnexal mass is then obscured by the great involvement of the broad ligament or ligaments. Even here conservative treatment does well unless temperature reactions

are high, pain is great, and the size of the exudate is continually increasing. Then vaginal incision drains the pus and hastens convalescence. Such cases, when treated by the abdominal route during the acute stage, usually prove fatal. The greater the localization of exudate in the connective tissue, and the earlier the occurrence of closure of the tubes, the less marked and the less dangerous is the associated pelveo-peritonitis.

The treatment of parametritis following labor or abortion demands, of course, rest in bed, fluid diet, attention to the bowels, the application of the ice-bag or the ice-coil to the abdomen. Cool or tepid vaginal douches should be given several times a day of 1:10,000 to 1:5000 oxycyanid of mercury or 1 per cent. lysol. The formation of a large mass in the broad ligaments or in the posterior parametrium, associated with continued pyrexia, increase in size, and pain, is relieved by incision and drainage through the vagina. Many of these cases in which the exudate is hard and firm, and in which the temperature reactions are not high, may be brought to resorption without incision and drainage. Rest in bed plus the use of vaginal douches, plus the subsequent use of glycerin and gauze applied to the fornices, will bring about a fair restoration to the normal in many instances, even though this treatment takes weeks and not infrequently months. The end lesions in the majority of these cases are chronic parametritis, pyosalpinx, and perimetritic adhesions.

The treatment of parametritis chronica, most frequently of the form of posterior parametritis, is essentially the treatment of the causal cervico-uterine inflammation or catarrh, and as such is fully described in the section on Endocervicitis.

The treatment of an exudate a week after the fever subsides consists of stimulating applications to the abdomen, hot douches of 4 quarts of normal saline solution two or more times a day. If elevation of temperature returns and if bimanual examination detects evidence of softening and increase in size of the exudate, then hot douches and the hot applications must be discontinued. If, however, resorption is taking place, and if fever is absent, abdominal and vaginal applications to produce hyperemia, followed at a later period

by gentle massage after the heat treatment, are excellent. The resulting hyperemia diminishes pain, stimulates the nutrition of the tissues, increases the power of resorption, and promotes the lymph flow. If an exudate is situated in the cul-de-sac of Douglas, thorough vaginal packing of the fornices and a tight abdominal binder are useful. In the later stages, salt baths, especially in the form of warm, prolonged sitz-baths, and of Nauheim baths are of value. Edema of the parametrium readily disappears under thorough vaginal packing of the fornices, carried out in the modified Trendelenburg position. (See page 138.)

When sclerosis or parametritis atrophicans occur, with dislocation of the uterus and the adnexa, hyperemia must be encouraged to alter the sclerosis of the connective tissue so that bimanual massage may then restore the ligaments to their normal length. This demands hot sitz-baths and prolonged vaginal saline douches, very hot, to render the shrunken ligaments hyperemic, anesthetic, succulent, and stretchable. If this is followed immediately by vagino-abdominal massage, and glycerin and gauze packing, fixations can be loosened, adhesions can be stretched, and displacements can be corrected. The occurrence of fever or pain after such treatment contra-indicates the treatment. (See pages 141, 142, 149, 151.)

In the treatment of older cases Nauheim baths and salt baths are of value. The benefits of this method are not permanent, however, if during and after the baths mechanical stretching of the uterine ligaments is omitted.

PELVIC PERITONITIS; PERIMETRITIS

Perimetritis is an inflammation of the peritoneum of the pelvis resulting in adhesions of the adnexa, intestine, or pelvic peritoneum, and especially of the uterus. It may be septic or gonorrheal, acute or subacute. It occurs most frequently as the result of the extension of a cervico-uterine inflammation through the tube or through the broad ligament lymphatics, sometimes from appendicitis and peritoneal tuberculosis.

If the tubes do not become closed and pus exudes, or if the infection rapidly involves the pelvic peritoneum, a peritoneal exudate results. Therefore in the more acute forms with the symptoms of peritonitis there results an accumulation of exudate of varying amounts in the cul-de-sac of Douglas, which can be easily outlined only when under the tension which occurs when the exudate becomes encapsulated. In the presence of much exudate the uterus is pushed forward and upward and a mass or tumor is felt back of the portio. When the exudate is encapsulated or organized its upper surface is not smooth or round, because it is formed by intestines. Often the inflamed adnexa are noted postero-lateral to the uterus, but the tubes and ovaries may be involved in the cul-de-sac of Douglas, with the peritoneal exudate. After an acute infection there may result simply adnexal tumors, more or less adherent to intestine, especially sigmoid, etc., which are usually situated postero-lateral to the uterus, or there may result adhesions which totally obliterate the cul-de-sac of Douglas, or there may be a fixed retroflexion of the uterus.

There may be adhesions passing from the posterior wall of the uterus to the pelvic peritoneum. The lower part of the cul-de-sac of Douglas may be obliterated. The fundus may be fixed by stretchable bands. As a rule, the greater the involvement of the tubes, the greater is the adhesion of the uterus to the pelvic peritoneum.

In acute infections the tubes may quickly become closed and adhesions are present mainly about their outer ends.

The milder forms of perimetritis are more frequently encountered, and differ in their consequences. There has never been an acute process, the condition being due to infection of the peritoneum by a catarrhal salpingitis, in the vast majority of cases gonorrheal in nature. The tubes have not been greatly inflamed, have not become distended, and have not dropped down by their own weight to the floor of the pelvis. The adnexa are involved in mild adhesions; smaller or larger tubo-ovarian cysts may result and are often fixed close to the lateral pelvic wall. In many cases the adnexa may seem free on bimanual examination.

We should make a distinction between the various localizations of adhesions after any form of peritonitis. Adhesions of the tubes to the posterior wall of the broad ligaments or adhesions of the outer ends of the tubes are always present with *pyosalpinx or pyosalpingitis.*

Many infections are of a mild nature; very little discharge pours out. It results in closure of the tube-ends or in adhesions of the tube-ends to peritoneum or peritoneally covered structures. A diffuse pelvic peritonitis has not taken place and the uterus itself may be free of adhesions of any form, *i.e.*, a mild *salpingo-oöphoritis.*

If, without marked tubal involvement, the ovaries are entangled in adhesions, the term *perioöphoritis* should be used. The uterus is free of adhesions.

If the uterus on its posterior wall is held by adhesions, then the term *perimetritis* should be used. This implies the previous existence of a pelvic peritonitis or a pelvic exudate situated in the cul-de-sac of Douglas, from which adhesions result.

When the uterus itself is fixed, we are really justified in speaking of perimetritis, though the term is often used to signify the various forms of adhesions in the female pelvis.

If adhesions are present on its posterior wall the uterus is more or less firmly fixed, according to whether the adhesions are extensive, long or short, dense or stretchable. Care must be taken not to confuse this condition with a retroflexion which is

simply in contact with the posterior peritoneum and the rectum, and which may be difficult to replace. The uterus may be pulled back into retroversion or retroflexion by adhesions of the adnexa and by the sclerosis and shrinking of the ligamenta infundibulopelvica.

Differential Diagnosis.—A differential diagnosis between parametritis and perimetritis is necessary. All lateral tumors which have a sharp, round, lower border are not likely to represent parametritis. In the more acute stage a lateral parametritic exudate has an upper border of a rounded character, whereas a perimetritic condition has a diffuse upper border through adhesions of the intestines, while its lower border is sharp because it is outlined by the peritoneum of the cul-de-sac of Douglas. When perimetritic bands are felt through the posterior fornix, care must be taken not to mistake for them the thickened uterosacral ligaments. If more than two bands are felt, the condition is probably a perimetritis.

In many of these cases the uterus is retroverted or retroflexed, and the pain and other annoyances from which the patients suffer are attributed to the retrodeviation. In other cases there is a real inflammatory endometritis and erosions and cervical catarrh are present. For that reason, too, annoying symptoms such as pain, etc., are often attributed to intrauterine disease when peritoneal adhesions are the important pathologic factors. The diagnosis of peritoneal adhesions is one often made by exclusion. Perimetritis is often found on operation when not disclosed by bimanual examination. Adhesions make some patients miserable while in other women extensive adhesions cause little or no annoyance. If the mobility of the uterus and its adnexa is limited, if repeated examinations produce the same pain by the same manipulations, the examiner may presuppose either a parametritis or perimetritis. If posterior parametritis can be excluded, the diagnosis rests between paraoöphoritis and sclerosis of the ligamentum infundibulopelvicum on the one hand, and perisalpingitis and perioöphoritis on the other. With peritoneal lesions the tube and ovary are fixed.

Treatment of Pelveo-peritonitis.—In the acute stage of pelveo-peritonitis rest in bed is of course essential. The

rubber ice-coil is applied to the abdomen or else an ice-bag separated from the skin by gauze. Cold sponging and the usual antipyretic mode of treatment should be instituted.

In peritonitis the abdominal viscera and the omentum are engorged with blood, so that other parts of the body are deprived of it. The proper mode of treatment is to replenish the empty body vessels, according to J. Berry. The effusion of serous fluid in the peritoneal cavity soon loses its germicidal power. Draining this fluid through operation leads to the effusion of fresh serum and the consequent increased destruction of bacteria. In the treatment of peritonitis with no collection of fluid in the peritoneal cavity there is a small amount of toxins in the peritoneal cavity. Treatment then consists of free purgation by salines and the administration of large quantities of fluid by the mouth, rectum, under the skin, or intravenously. A thorough cleansing of the intestines should be followed by starvation diet, and the intestines should then be kept at rest by hypodermic injections of morphin.

The head of the bed should be elevated. In a more diffuse peritonitis with distention of the whole abdomen the patient must be kept quiet and the stomach empty until the inflammatory process and exudates have become localized. With increasing accumulation of exudate, this should be removed per vaginam and the pelvis should be packed with iodoform gauze, according to the recommendation of Pryor. In diffuse cases the sitting posture advocated by Fowler and the administration of 5 per cent. glucose and 2 per cent. bicarbonate of soda solution by rectum every two hours are essential.

In the subacute stage cold cloths changed every four or five hours, or else a Priessnitz bandage, should be applied and the bowels moved regularly by enemata.

In the chronic stage warm and hot sitz-baths and warm full baths may be given. If exudative elements are present and there is no elevation of temperature, gentle but not too firm packing of the fornices with glycerin and gauze may be practised. In the presence of exudation, with fever absent, salt baths and the Nauheim baths are valuable. In old cases with the formation of adhesions a course of Nauheim baths associ-

ated with mechanical stretching of the adhesions is of great importance. Prolonged hot vaginal douches may be given as a preliminary to the bimanual stretching of peritoneal bands.

However, the very large majority of cases of perimetritis occurring otherwise than in connection with abortion or labor are gonorrheal in origin, and the therapy of this form is described under that section. The end-results of a perimetritis, whether originally subacute or acute, are adhesions. These adhesions exist in connection with a pyosalpinx or a salpingitis or a salpingo-oöphoritis or tubo-ovarian cyst. The therapy, therefore, in these cases is surgical if pain persists. There is a large group of cases, however, in whom the adhesions about the tubes and ovaries or about the uterus are slight, stretchable, and often not made out on bimanual examination, but suspected because of the continuation of pelvic pain. A very few of these cases may be relieved of their annoyance by the use of hot vaginal douches, hot salt sitz-baths, Nauheim baths, and the vaginal therapy applied in the case of cervical catarrh. The application of a moist bandage at night sometimes affords relief. These milder cases are frequently such as complain mainly of sterility, and they furnish the very largest proportion of the patients subjected to the so-called conservative operations on the adnexa.

UTERINE RETRODEVIATIONS; RETROVERSIO FLEXIO

In considering the supports of the uterus it is necessary to remember that it is embedded in, and surrounded by, a large amount of connective tissue. Originally no pelvic fascia exists, since every muscle fascia is simply connective tissue which has been developed by tension and exercise. The pelvis in the fetus is filled with a non-differentiated connective tissue, forming a common support for the pelvic contents, uniting and dividing the different organs and permitting mutual movement, as well as uniting the pelvic contents to their surroundings. The peritoneum covers all the organs and lines the depressions, covering especially the uterus, the tubes, and the vessels which run to the uterus. The ligaments are simply peritoneally covered connective-tissue bands, surrounding the important blood-vessels, and in them muscle fibers subsequently develop. The only ligament which is not formed passively is the ligamentum teres; it is preformed, while the others depend for their position upon the development of the uterus. While it is true that a lack of elasticity on the part of the uterine ligaments is a frequent cause of inhibition of uterine mobility, no one of them is an active factor in preserving the normal anteflexed position of the uterus. An important function of the parametria with their numerous muscle fibers is to preserve the cervix in an elevated position, and they are intended to give the uterus free play. Winter says: "The uterus may be pulled up to the symphysis, pushed into the sacrum, up to the lateral pelvic wall, or half-way up to the umbilicus; the portio may be pulled down to the vulva, and all this without pain." When the uterus is pushed up or pulled down, it returns to its normal place because of the elasticity of its surroundings. It belongs, therefore, to the most movable parts of the body, which fact speaks against an active influence on the part of the peritoneum or any one ligament in determining its position.

In the adult woman the uterus lies between the planes of the pelvic inlet and outlet. In the standing woman, with the bladder empty, the uterus is in a horizontal position. The cervix is nearer the posterior than the anterior pelvic wall, and lies in a plane passing through both spinæ ischiadicæ. A perpendicular from the external os passes through the posterior portion of the perineum; from the internal os a perpendicular would pass through the middle of the perineum, while one from the anterior end of the corpus, which lies on a level with the fourth sacral vertebra, passes through the middle of the septum urethrovaginale (Waldeyer). It may be seen that, in this position, the cervix is much further back and but little lower than the fundus. The cervix enters into the upper end of the vagina at an angle with the latter, and the fixation of the vagina by the levator ani and the surrounding connective tissue, and the support furnished by the parametria, make the situation of the cervix a relatively fixed point. So long as the cervix is retained in this position and at this level, so long as the uterus, its "ligaments," and the levator ani preserve their natural elasticity, so long will the forces of pressure and tension within the abdominal cavity preserve the uterus in its normal anteflexed position.

Version implies that change of position of the uterus in which the cervix goes in one direction and the fundus in the opposite direction. The straight line of the uterus is preserved. If the fundus is further forward than is normal, the position is known as *anteversion*. If the fundus is further back, it is known as *retroversion*. In anteversion the uterus is straight, the cervix is high up, and points toward the sacrum. In *lateroversion* an old inflammatory process in the broad ligament connective tissue through retraction pulls the cervix toward itself and the fundus goes in the opposite direction, or else the retracted connective tissue pulls the fundus toward itself. In *retroversion* the fundus is situated posteriorly near the sacrum, the cervix is more anterior, and the canal of the uterus is straight.

Flexion implies a change of position of the fundus in relation to the cervix with the formation of an angle at their junction. *Anteflexion*, when pathologic, means that the angle at the

internal os is sharper than normal. The cervix lies in the axis of the vagina and the fundus lies so closely on the cervix that the finger can scarcely enter the angle. *Retroflexion* finds the fundus in the hollow of the sacrum or in the cul-de-sac of Douglas. The cervix is nearer the symphysis and the angle between the fundus and the cervix looks posteriorly.

Retroversion is a step toward the formation of a retroflexion which takes place as soon as the region of the internal os becomes soft. In retroversion the fundus is near the sacral promontory. Gradations between this form of retroversion and the most acute retroflexion are called *retroversio flexio*. The cervix is nearer the symphysis (Fig. 91) and the anterior wall of the vagina seems shortened. In pregnancy in a retroflexed uterus the cervix is pushed up right behind the symphysis. With retroversio flexio there is a dislocation of the tubes and ovaries to the floor of the pelvis or into the cul-de-sac of Douglas if the ligamenta infundibulopelvica are lengthened. The nearer the cervix approaches the symphysis, the more it inverts the bladder wall.

Retroflexion.—Under retroflexion (and retroversion) we must distinguish two forms—*the congenital and acquired*. Suffice it to say that in acquired retrodeviation the position of the uterus is due to such weakening of the parametria, especially the ligamenta lata, ligamenta infundibulopelvica, and the uterosacral ligaments, that the cervix descends and moves forward toward the symphysis (Fig. 91). Therefore the fundus moves backward, for in the standing position the uterus is no longer horizontal. There results, then, a retroversion or retroflexion. *Thus the primary descent of the uterus, or hysteroptosis, is the pathologic condition which causes the acquired retrodeviation.* This condition of hysteroptosis is an important factor in the causation of numerous symptoms. It is by no means necessary that hysteroptosis should be complicated by a retrodeviation if the round ligaments and ligamenta infundibulopelvica are short, but acquired retroflexions and retroversions are the result of hysteroptosis. This discussion concerns mobile conditions, for a retroversio flexio fixata involves a peritonitic affection, *i. e.*, a perimetritis.

Congenital Retrodeviations.—It is interesting to consider the etiology of congenital retrodeviations, and to note the frequency of their occurrence. No further proof is then necessary to establish the fact that retroversio flexio *per se* is not a severe pathologic condition.

In the embryo the Wolffian ducts take a course which follows the curve of the fetal body, and the ducts of Müller make their way following closely the curved lines of the Wolffian ducts. The sexual strand, which includes the ducts of Wolff and the ducts of Müller, at an early stage shows an angle which represents the situation of the external os of the cervix. In the future development of the embryo the proximal end of the sexual strand, the subsequent uterus, takes on a position of anteversion. This position is aided by the descent of the ovaries and the remains of the Wolffian body, and by the pressure of the intestines gradually filling with meconium. This pressure can be appreciated from the fact that on the ovaries and tubes impressions of the intestines may be recognized. The anterior curve of the uterus becomes gradually more pronounced, so that in some cases the corpus uteri lies horizontally. This second resulting angle represents the position of the future internal os. In embryos in the second half of pregnancy the uterus is usually anteverted, with a somewhat anteflexed corpus. In the newly born the uterus rarely lies in the median line, but shows, as a rule, a deviation to one side or the other. It lies partly within the large pelvis, and the fundus projects above the inlet. It is therefore seen that anterior inclination of the uterus, with more or less anteflexion of the corpus, is the original position depending on certain processes of embryonal development (Nagel).

In the newly born fetus the intestinal tract and the urachus are thin tubes, while the genital tract fills out the remainder of the long, narrow pelvis, and the relatively large uterus lies mainly above the symphysis. The bladder is not yet unfolded, is long, and its fundus remains for a long time above the symphysis. With the gradual development of the bladder from its pyramidal to a round form, the pelvis also undergoes changes whereby it is no longer a straight continuation of the

abdominal cavity, and its axis forms with the axis of the latter an angle which gradually becomes one of 90 degrees. The pelvis becomes wider, and the urethra is no longer a straight continuation of the bladder, but forms with the long axis of the latter a curve which is concave anteriorly. The uterus, which in the fetal period filled out almost the entire straight, narrow pelvis, is now only a small dependence on the posterior wall of the bladder, and, lying parallel to the main axis of the pelvis, the uterus takes on with the changed inclination of the latter, a still more anteverted position. The anterior inclination of the pelvis becomes later still more pronounced, and is necessary for several reasons. One is that the bladder, when filled with fluid contents, would otherwise be carried as a burden by the elastic pelvic floor alone, and a complete emptying of its contents would be impossible, for the lowest point of the pelvic floor in an upright position would lie lower than the external opening of the urethra. If, then, the pelvis did not take on a forward inclination, a condition like that in cystocele would result, for the bladder of the female lies deeper than that of the male (von Arx).

The ovary descends from its point of origin at the sides of the upper lumbar vertebræ, and lies in the newly born on the psoas and the vasa iliaca externa. Its final position in the fossa ovarica is reached during childhood. The ovary is connected with the tube and the ligamentum ovarii proprium, but does not make the complete descent which the testicle does, although conditions are favorable, as is proved by those cases where the ovary or tube is found in the canal of Nuck. In the ligamentum genito inguinale, later the ligamentum teres, is a muscle homologous to the cremaster. The ligamentum suspensorium ovarii is the former plica phrenico-mesonephrica.

Although embryonal processes bring the uterus into the position known as anteversio flexio, errors of development may be the cause of malposition. The formation of a short vagina, with an embryonally long cervix and small fundus, displaces the cervix so that it lies close to the anterior pelvic wall, and the action of abdominal pressure may then change this retroversion into retroflexion. In the descent of the ovaries the presence of

a short ligamentum ovaricopelvicum prevents the normal anteflexion of the uterus, so that, even if other factors produce no further change, a retroversion exists. Küstner finds a poorly developed corpus and a straight stretched retroverted uterus to be often present in a poorly developed fetus, while in a well-developed fetus a normal flexible anteflexed corpus is the general rule. Further, a fixation of the portio near the anterior pelvic wall, as a result of a poorly developed or short anterior vaginal wall, is productive of a malposition of the uterus. Such conditions have been found frequently enough in the fetus to explain the origin of congenital deviations, so that embryonal development is responsible, not alone for the normal position of the uterus, but likewise for a large proportion of malpositions.

Symptoms Attributed to Retrodeviation.—Considering the numerous operative methods devised for correcting retrodeviations of the uterus, and the extensive application of the several varieties of round ligament operations for the correction especially of mobile retrodeviations, it would seem that retroflexio versio uteri was of itself a condition demanding operative treatment. The symptoms attributed to retrodeviations are pain, leukorrhea, menorrhagia, reflex nervous symptoms, and sterility. The pain takes the form of backache, pain in the sacral region, headache, and pain in the abdomen and thighs. The backache is supposedly caused by pressure of the uterus on the nerves, acting through the intervening structures, or by the "exudate and adhesions which often accompany the displacement, or by circulatory interference which causes congestion and obstruction to the venous flow." Pressure on the rectum is supposed to cause constipation and pain. Headache accompanies the backache, especially if there is constipation. Leukorrhea is said to be often the only symptom for which the patient seeks relief. In other instances the only symptom is sterility. Frequency of urination is supposed to be caused by the pulling exerted on the anterior vaginal wall, on the urethra, and on the vesico-uterine fold. Menorrhagia or metrorrhagia is said to be present in some cases. Dysmenorrhea is also mentioned as a symptom and painful coitus is said to be present in a smaller number of instances. In some cases, even where

there are no local symptoms, there are said to be general symptoms in the form of indigestion, nervousness, skin affections, general pain, eye ache, etc. Epileptiform attacks are mentioned as symptoms in a smaller number of cases.

The annoyances so frequently found associated with these displacements, such as dysmenorrhea, sterility, metritis, endometritis, oöphoritis, bladder, rectal, and nervous symptoms, have been viewed from two entirely different standpoints. The belief, on the one hand, is that complications alone are the cause of the symptoms, and that the latter are not the result of the version or flexion. This view is substantiated by the fact that before puberty and after the menopause deviations are found without annoying symptoms; by the additional fact that the same symptoms are present with the above-mentioned complications without uterine deviations; and by the important fact that treatment of the complications often brings about a cure. The opposite view is supported by the statement that treatment of the deviation relieves the annoyances, that close examination shows the same symptoms to have existed before puberty and to continue after the menopause. The congestion of menstruation is considered, in the latter view, as being naturally an important element in increasing the annoyances during functional life.

The fact that some cases exhibit no symptoms is explained by the varying nervous stability of patients, and by the statement that structural changes do not occur in the pelvic tissues in all cases. The failure to cure the symptoms after the retrodisplacement is corrected is explained by the fact that permanent structural alterations have occurred in the uterus, ovaries, and circulatory apparatus. The fact that the correction and cure of the complications often give relief, even if the malposition is not corrected, is explained as occurring only in those cases where the complications are independent of the retrodisplacement or are the cause of it.

The uterus is stated to have a most intimate connection with the cerebrospinal nervous system and with the solar plexus or "abdominal brain" of Byron Robinson. Reflex impulses are supposedly sent out by a retroflexed uterus to the abdominal

viscera and the spinal cord, with resulting alteration in the functional activity of the intra-abdominal organs and the nervous system.

The Dignity of Retrodeviations.—The objection which can be raised to the attitude of those who attribute so many annoyances to retrodeviations, and who favor operative treatment for that reason, is that they report large series of cases of retroversions and retroflexions without finding among them a large number of inflammatory and trophic alterations involving the uterus, tubes, and ovaries. It is impossible in a large series of cases not to have among them, in addition, a great number suffering from neurasthenia, from enteroptosis, from gastroptosis, and from pelvic, abdominal, and constitutional subinvolution. The backache so generally referred to the retrodeviation is usually due to hysteroptosis, gastroptosis, and *most frequently to a posterior parametritis involving the uterosacral ligaments especially*. Uterine leukorrhea is almost always an inflammatory condition due to catarrh of the cervix and uterus. While it cannot be denied that, associated with retroflexion, there may be annoyances due to congestion, yet entirely too much stress is laid upon the influence of a version and flexion. Structural alterations of the lining of the uterus, of the wall of the uterus, and of the tubes and ovaries, not the result of the retroversio flexio, are overlooked. The vast majority of cases with symptoms have lesions of these structures which are not always demonstrable by bimanual examination.

I hold the opinion that uncomplicated retrodeviations cause no annoyance, that nervous or "reflex" symptoms do not result from retrodeviations, but are caused by other conditions having no direct relation to the retroflexion. Theilhaber finds that after reposition the subjective symptoms may disappear in a few days, and yet examination shows the uterus to be retroflexed in spite of the pessary. This proves that the pessary by relieving the primary hysteroptosis relieves congestion, whether the uterus is retroflexed or anteflexed. In a large percentage of cases the patients notice no improvement as regards their nervous symptoms and their local disturbances, yet frequently examination shows the replaced uterus to be in perfect ante-

flexion. He finds no improvement as regards fluor, in spite of reposition of the uterus, and the bleedings are diminished decidedly in very few cases. I do not believe that version or flexion of the fundus causes a congestion in the uterine circulation. Dickinson says that deviation or malposition of the uterus does not affect the circulation of the uterus, as the circle of Robertson assures a perfect blood-supply. Further, the symptoms in many cases of decided retroflexion are almost *nil*, while in innumerable instances a mobile uterus, but little displaced, causes the so-called "typical symptoms" of retroflexion.

Frequency of Retroversio Flexio.—The examinations of Schroeder are of the greatest interest. To determine the frequency of retroversio flexio in healthy women, and in women not suffering from pelvic symptoms, he examined one hundred and eighty-four women six weeks post partum, eighty-two other patients complaining of no pelvic symptoms, and one hundred and forty-five general cases in the internal medical clinic in Königsberg. His examinations of four hundred and eleven patients included virgines intactæ, nulliparæ, and multiparæ. In twenty-five virgines intactæ without pelvic symptoms, he found a retroversio flexio ten times. In forty-nine nulliparæ without pelvic symptoms he found fourteen cases of retroversio flexio. Three virgines intactæ with pelvic symptoms furnished one case of retroversio flexio, while five times retroversio flexio was found in thirteen nulliparæ suffering with some pelvic symptoms, giving for ninety nulliparæ thirty cases, *i. e.*, 33 per cent. of retroversio flexio.

One hundred and ninety-one multiparæ without pelvic symptoms furnished forty-two cases of retroversio flexio, while twenty-nine retrodeviations were found in eighty-five patients acknowledging some pelvic symptoms, making a total of seventy-four cases of retroversio flexio in two hundred and seventy-six multiparæ, *i. e.*, 26 per cent.

At the menopause, thirteen times retroversio flexio was found in thirty-eight patients without pelvic symptoms, while four cases were found in seven women with pelvic symptoms, giving seventeen retrodeviations in forty-five patients, *i. e.*, 27 per cent.

In these four hundred and eleven women were found 18 per cent. of retroversions and 10 per cent. of retroflexions, giving a total of 28 per cent. In three hundred and three patients without pelvic symptoms were seventy-nine retrodeviations, 26 per cent. In one hundred and eight cases with symptoms were thirty-nine retrodeviations, 36 per cent. It is significant that the symptoms were brought out only on special questioning.

It seems, therefore, that 25 per cent. of women in general have retrodeviations of the uterus, of which two-thirds have retroversions and one-third retroflexions. Of the seventy-nine cases of retrodeviation without pelvic symptoms, eight suffered from hysteria, three from neurasthenia, four from indefinite stomach symptoms, three from headache, and others from backache, dizziness, ischias, lumbago, etc. Of these seventy-nine cases only sixteen evidenced a more or less profuse menstruation, so that menorrhagia is not a result of retroflexion.

Of thirty-nine cases of retrodeviations with symptoms, six nulliparæ complained of some pain in the pelvis and back, with some disturbance (pain) during menstruation; five had aborted or had painful folds of Douglas; eleven had shortened, infiltrated, and painful parametria; three had descended ovaries, and five descent of the anterior vaginal wall, giving twenty-four cases suffering from pain in the pelvis or back in whom causes other than the retrodeviation could be readily found.

This review is quite sufficient to establish the fact that congenital retrodeviations are very frequent, and that congenital retroversio flexio usually constitutes a practically negative condition so far as local symptoms are concerned. Congenital retrodeviation is very frequently a stigma of general, constitutional inelasticity.

How large a proportion of those retrodeviations, found on the first examination, during pregnancy or after pregnancy or abortion, are such congenital retrodeviations every one must decide for himself.

The dangers of retroflexion and retroversion are the possible occurrence of incarceration of the pregnant uterus in the hollow of the sacrum, and future descent and prolapse of the non-pregnant uterus. For this reason retroflexion should be cor-

rected in all cases and retroversion when there is evidence of lack of elasticity of the pelvic ligaments and pelvic connective tissue. Besides, correction of acquired retrodeviation lifts up the cervix and overcomes the hysteroptosis which is the etiologic cause, and so tends to relieve congestion and the sense of pelvic weakness and looseness.

Relation to Pregnancy.—The course involved in pregnancy, however, is shown by the rare occurrence of retroflexio uteri gravidi incarcerata. Martin found in 24,000 gynecologic patients one hundred and twenty-one cases of retroflexio uteri gravidi, none of which caused decided annoyance. Of these, ninety-four came under observation with retroflexio uteri gravidi, while twenty-seven became gravid after they had been under observation. All these cases are probably pregnancies in a uterus already retroflexed. The majority of such cases are not noted because practically no symptoms are present. But incarceration may occur and therefore retroflexions should be corrected.

Relation of Retrodeviations to Prolapse of the Uterus.—In the opinion of Küstner prolapse of the uterus results from a retroversio flexio, while Veit holds that prolapse of the vaginal wall is an important factor in pulling the uterus out of its normal position. If the view of Küstner be strictly correct, the frequent occurrence of congenital retroversio flexio should be often followed and complicated by marked hysteroptosis, which, however, is not the case. Considering how difficult it often is, in a vaginal hysterectomy, after opening the vesico-uterine plica, and after entering by incision into the sac of Douglas, to bring down the uterus, we may understand how improbable it is that the descending vaginal wall alone can markedly affect the uterus, as Veit believes. Only when the parametria at the sides of the cervix and uterus are incised do we make a decided impression upon the uterus.

Retroversion and the bringing of the uterus into the axis of the vagina does give opportunity for descent and prolapse of the uterus through the influence of intra-abdominal pressure against the uterus, which constantly pushes it down through the axis of the vagina, but an involvement of the ligaments about the uterus and of the connective tissue in the pelvis and about

the vagina, and the lack of the pelvic and general elasticity, are the important preliminary factors.

Acquired Retrodeviations a Stigma of General Inelasticity.—The changes and injuries resulting from pregnancy and labor have always furnished an important topic for the gynecologist. In the light of our present knowledge, local or general symptoms are seldom attributed to torn perineums or lacerated cervices. Neither are uncomplicated uterine versions and flexions held universally responsible for the various physical and nervous annoyances supposedly caused through reflex channels. Numerous observations have taught us that retroversions and flexions are either congenital or acquired. We know that such displacements may exist with or without a pathologic involvement of tube, ovary, connective tissue, or peritoneum. Yet lesions of these latter structures are often overlooked, because a displacement, when found, is so generally accepted as a causative factor in producing almost any complaint.

On the other hand, daily instances come to notice of totally uncomplicated versions and flexions with symptoms, and of others without symptoms. Very many more instances may be noted of like annoyances without uterine flexion or version. We now understand the symptoms accompanying cases of hysteroptosis which are not complicated by version or flexion; for the condition of subinvolution of the ligaments is the important factor. In very many instances such a local condition is only an evidence of the existence of an abdominal and general subinvolution. Frequently, movable kidney, gastroptosis, enteroptosis, etc., are found coexisting. Such patients often evidence a flabbiness and lack of elasticity which is by no means the result of the pelvic condition, so that we are compelled to regard the latter as a part of a general state. It is evident that non-inflammatory acquired displacements are the result of changes in the uterine ligaments, changes which include congestion and edema, and that such alterations result first in a descent of the uterus, a hysteroptosis. The treatment of these associated lesions, and attention paid to the general condition of the patient, mark an important advance in the field of gynecology, and lead, in many instances, into the

realms governed by the stomach specialist and the neurologist. The error of following the principle of *cum hoc, ergo propter hoc* is gradually being corrected. If gynecology has evolved numerous operative procedures for the correction of uterine displacements, it has also opened the eyes of the medical man to the fact that careful and complete restoration to the normal is an essential in post-partum treatment, and that such care covers a period of ten weeks rather than of ten days.

Hysteroptosis is associated with symptoms which may be understood when the annoyances associated with gastro-enteroptosis, ren mobilis, etc. are recalled. Above all, the predominant pathologic element is *congestion* and edema, not only of the uterus and adnexa, but especially of the connective tissue constituting the parametria.

Post-partum Treatment.—In post-partum treatment, therefore, great care should be taken to avoid hysteroptosis and a probably resulting retrodeviation. Küstner advises an upright position within a few days after labor, believing that in this way, and through the consequent exercise given to the uterine ligaments, the normal position of the uterus is assured. An all-important fact is that involution should include not only a return of the uterus, but a return of all the pelvic structures and the pelvic connective tissues, to a normal condition and normal position. This is especially important in cases in which forceps have been used. Some obstetricians follow the practice of having their patients lie on the abdomen for a few minutes, several times a day, during the puerperium, as this position tends to throw the heavy uterine fundus forward.

The pessary as a preventive of permanent post-partum hysteroptosis is most valuable. The early and regular use of ergot or mammary extract is a most important factor if the patient cannot nurse her baby. The wearing of abdominal belts and binders is a salutary aid. Above all, abdominal massage, exercises, and hydrotherapy should have a permanent place in this field, for nothing else so relieves congestion, increases elasticity, and aids involution. An additional important benefit is the restoration to the patient of a normal general circulation by a course of Nauheim baths.

As soon as the patient gets out of bed, she should be encouraged to walk around her room, for a few minutes twice a day, on her hands and feet (not knees).

The Meaning of Retroversio Flexio.—Many retrodeviations are of congenital origin. Retroversio flexio *per se* is not a pathologic condition responsible for marked local or general symptoms. The symptoms generally associated with retroflexion are not typical, are present in innumerable cases without displacement, and are due to uterine, tubal, and ovarian complications. Where retroversio flexio without peritoneal, tubal, or ovarian complications is associated with symptoms, the primary hysteroptosis and abdominal and constitutional subinvolution must be taken in consideration, always bearing in mind the influence of such physical states as gastroptosis and ren mobilis. Prolapsus vaginæ and cystocele, while often associated with retrodeviations, are independent affections. Where retroversio flexio is accompanied by local symptoms, these, if not due to myometrial, peritoneal, tubal, or ovarian complications, may be corrected in the vast majority of cases without surgical treatment, for pelvic congestion is the important alteration. If the use of the pessary causes a cessation of symptoms, a surgical operation which keeps the uterus in normal elevated position permits of permanent removal of this support.

"Reflex" or constitutional symptoms are not due to retroversio flexio.

Diagnosis.—The diagnosis of the position of the uterus is made by bimanual examination, supplemented perhaps by the use of the sound. The two fingers of the examining hand are introduced into the vagina and so turned that the palmar surfaces look upward in the anterior fornix. The other hand presses upon the abdomen in the median line between the umbilicus and the symphysis. The external fingers gradually exert gentle deep pressure through the abdominal wall, moving gently down toward the symphysis. The internal examining fingers press upward, and if the uterus is in normal anteflexion and if the bladder is empty, the fundus will be felt by the internal fingers or between the external and the internal

fingers (Fig. 5). Do not forget that a uterus may be temporarily displaced backward by a full bladder.

If the uterus is anteverted or only slightly anteflexed, the internal examining fingers should be placed in the posterior fornix and the cervix should be lifted up toward the abdominal wall. The fundus is thus brought near the abdominal wall, and by the same external manipulation as before described the fundus will be felt by the external hand, and pressure on it will be communicated to the fingers situated underneath the cervix in the posterior fornix (Fig. 8).

If the uterus is retroflexed, the internal fingers should be introduced into the vagina, into the posterior fornix, the thumb should be situated over the clitoris, the two last fingers should be folded on the palm of the hand and pressed against the perineum. The weight of the body leaning against the elbow of the examining hand exerts pressure which pushes the internal fingers toward the hollow of the sacrum (Fig. 4). A retroflexed uterus will be then made out in the cul-de-sac of Douglas or higher up, and the cervix can be followed in continuity over the posterior angle into the fundus (Fig. 6). Pressure by the external hand on the abdominal wall between the umbilicus and the symphysis increases the intra-abdominal pressure and brings the fundus closer to the internal fingers.

If the uterus is retroverted, the same manipulation should be used in passing the index and middle fingers high up into the posterior fornix. The external hand begins deep pressure at the promontory of the sacrum. In many cases then the internal fingers can pass along the cervix in a straight line up to the fundus of the uterus. In other cases the external fingers locate the fundus underneath the promontory of the sacrum. In many cases in nulliparæ and in patients with tense or fat abdominal walls neither the external nor the internal fingers can feel the fundus. If the fundus is sought for in its normal anteflexed position and not felt (Fig. 7), and if it is not found retroflexed, the uterus may be safely considered to be midway between these two positions, namely, in retroversion.

Not alone for the purpose of placing the uterus in its normal position, but also as an aid in determining its position, as well as

for the purpose of determining its mobility, the two following steps should be carried out in every bimanual examination: (1) Without the aid of the external hand the internal fingers should be passed deeply into the posterior fornix and underneath the cervix, and the cervix should be lifted up toward the abdominal wall (Fig. 92). This puts the uterosacral ligaments and the posterior parametrium on the stretch. If then the middle finger be passed from right to left in the posterior fornix, thickened uterosacral ligaments can be detected and any peritoneal adhesions on the posterior wall of the uterus can be felt (Fig. 93). At the same time the mobility of the uterus is defined and pain will be produced in the back and in the rectum in pathologic involvements of the posterior parametrium, and greater pain with peritoneal adhesions. (2) After performing this manipulation the index-finger should be placed in the anterior fornix and the middle finger high up in the posterior fornix (Fig. 94). The index-finger then pushes the cervix down and backward, which manipulation, when repeated several times with increasing firmness, always preceded by the lifting of the cervix, will bring a movable fundus further forward toward the symphysis (Fig. 95), especially if with retroflexion the middle finger at the same time pushes up on the fundus. If then the external hand be pressed deeply down toward the hollow of the sacrum behind the point to which the fundus is brought by this manipulation, and if these fingers pull or massage the fundus toward the symphysis, almost every case of movable retroversion and retroflexion can be brought temporarily into normal anteversion or anteflexion (Fig. 96). If the external fingers be passed behind the uterus and the uterus cannot be brought forward or can be brought forward only with pain, we may presuppose the existence of peritoneal adhesions to the uterus or fixation of the tubes and ovaries with shortening of the ligamenta infundibulopelvica, or else we feel the retracted uterosacral ligaments. In such instances the middle finger of the internal hand being passed high up into the posterior fornix can make out the peritoneal adhesions, and if passed into the lateral fornices can determine the lateral or deep fixation of the tubes and ovaries.

In doubtful cases, if there is absolute certainty that pregnancy does not exist, the sound aids, by the direction taken by the tip of the sound, in determining the position of the fundus. The sound is not of great importance in determining the position of the uterus in uncomplicated cases, but is of great aid in the differential diagnosis, especially if a mass in the posterior fornix is thought to be a fibroid or a parametritic exudate or a pelvic hematocele or pelvic exudate.

Treatment.—Since the danger of retroversio flexio consists in the frequent occurrence in multiparæ of further descent and prolapse of the uterus, the uterus should be restored and kept in place in its normal position. In many cases the annoyances are not severe enough to justify operation or the patient refuses operation. Then the pessary should be used for months or years (Figs. 97, 98, 99, 100). The percentage of permanent cures by pessaries is small. Permanent results are obtained by the various forms of operation devised for retroversio flexio. In a certain number of cases, especially such as are known not to have been congenital, and which have developed after labor and which are seen before involution has taken place in some ligaments while others are in a state of subinvolution, the use of the pessary often brings about a permanent cure. In general the use of the pessary should be avoided, when there are inflammation or adhesions about the uterus. There are some cases, however, in which, in spite of old adhesions of the adnexa, reposition of the uterus and the use of the pessary cause no discomfort. In such cases, which are rare, the use of the pessary is sometimes advisable. (See pages 125, 126.)

Retroversion.—Pessary treatment of retroversion is advisable to avoid the occurrence of retroflexion or of further descent of the uterus. In some cases it seems as if retroversion contributes to the production of bladder symptoms. In mobile retroversion the patient should sleep on one side or on the other and as much as possible on the abdomen, and should avoid overdistention of the bladder.

The treatment of *fixed retroversion* is the treatment of perimetritis. The softening and loosening of adhesions is the important point. Intravaginal pressure-therapy by glycerin

and gauze packing is of value, especially if the adhesions on the posterior uterine wall extend to a fixed point, that is, the pelvic wall. Prolonged warm and hot vaginal irrigations are used to soften the adhesions and to make the manipulation involved in bimanual attempts at stretching of the adhesions and correction of the retroversion less painful. The subjective annoyances are diminished by a course of Nauheim baths, which improve, in addition, the metro-endometritis. After a course of baths, stretching of the adhesions is much easier and this manipulation may be carried out during a course of the baths. If replacement is eventually possible, without pain and annoyance, a Hodge, Smith, or Thomas pessary may be inserted, provided, of course, there is no marked or purulent involvement of the adnexa.

Retroflexion.—Uncomplicated mobile retroflexion causes few or no general symptoms. When constipation, pain on defecation, dyspepsia, pain in the abdomen and back, and nervous symptoms are present, there is a natural inclination to decide that the position of the uterus must be corrected by operation. If, however, patients are not benefited by local conservative treatment and preliminary correction with the pessary, it is hard to understand how operation will correct the local and "nervous annoyances" of an uncomplicated retroflexion. The general state, with which a pelvic ptosis or retrodeviation is associated, is one of constitutional inelasticity, splanchnic neurasthenia, or physical or mental asthenia. In some cases, it is true, general treatment fails to cure the patient entirely of her symptoms. It is probable that slight nervous annoyances are sometimes relieved by operation; for the rest, change of surroundings and the mental effect associated with an operative procedure have a therapeutic value. In innumerable cases of retroflexion there are unrecognized involvements of the tubes, broad ligaments, ovaries, and peritoneum. There is no doubt that in some patients the value of the pessary is due to or enhanced by the element of suggestion, *i. e.*, by psychic influence.

The uterus may be fixed by simple adhesions of its body or may be fixed through adhesions of the adnexa. Adherent

retroflexion is ofttimes benefited by conservative treatment. The adhesions may be loosened and stretched by bimanual manipulation if no acute or subacute inflammations are still present about the uterus. If the bands are adherent to the pelvic wall, intravaginal pressure-therapy by glycerin and gauze packing may be used. Prolonged hot vaginal douches of 112° F. and over prepare the tissues for bimanual treatment. Sclerotic bands are softened by this method, by hot sitz-baths, or by a course of Nauheim baths, and in this manner a retroflexion may be corrected after such treatment when usual ambulatory methods do not avail. If eventually the uterus can be brought into normal position, it may in some cases be treated like a movable retroflexion and held in normal anteflexion by the use of the pessary.

Contact adhesion is to be treated by intravaginal pressure-therapy before using a pessary.

SUBINVOLUTION

Uterine Subinvolution.—In pregnancy the uterus undergoes great hypertrophy, hyperplasia, and dilatation, associated with which is a stretching, a growth, and hyperemia of the broad and other ligaments, and of the various pelvic structures. In addition, there is hyperemia and congestion of the intra-abdominal organs. The intra-abdominal organs and the abdominal wall are subjected to pressure and stretching by the enlarged uterus. The vascular system is put to greater strain and a general state of hyperemia and altered metabolism results. During pregnancy there is an increased amount of watery elements of the blood, an increased proportion of fibrin, a diminished amount of albumin, an increase in the white blood-cells, a relative diminution in the number of red blood-cells and in the amount of hemoglobin. Before labor the temperature is higher in the last three months of pregnancy and there is an increase in the elements of the body, equal to one-thirteenth of the body-weight. This increase is due to serous infiltration and to the increased ability of the body to form organized tissue. Post partum, after a temporarily short rise, the temperature is lower, the blood-pressure decreases and becomes normal on the sixth day. After labor there is a diminution of tissue change and a transitory diminution in the amount of urine.

The return to normal size, position, and condition (1) of the pelvic structures, (2) of the abdominal organs and of the abdominal wall, (3) of the general circulatory apparatus and of the nervous system, constitutes involution. This is a process which, for its completion, requires from three to six months, and which often fails to occur. The failure of involution (subinvolution) may be due to frequent successive pregnancies. It may result from a single labor.

Simple Subinvolution.—During uterine involution, fatty degeneration and atrophy of the muscle fibers occur, so that the muscle fiber may regain its normal dimensions. Failure of

uterine involution is often due to congestion in the uterus or in the surrounding tissues. Displacement of the uterus is an important factor. Retained placental structures or retained decidua are contributory elements. An important element is a poor general circulation. Uterine subinvolution is most frequent in women who do not nurse their babies. Within a few weeks after labor the uterus is large, soft, and atonic. The patient has a sensation of weight in the pelvis, there may be profuse serous discharge, there may be menorrhagia, there is backache, and atony of all the pelvic structures. If such a condition is allowed to persist, permanent changes take place. The same holds true of incomplete abortion.

Subinvolution Fibrosis.—Under the peritoneal covering of the uterus is a membrane of elastic fibers. In addition, between this layer and the mucosa there are three other layers of elastic fibers. The elastic and fibrous tissues situated between the muscle bundles have branches between and around every muscle cell at right angles to the long axis of the cell, furnishing a framework or elastic support which protects the fibers from overstretching and which permits their return to normal position on contraction. In pregnancy the elastic fibers undergo hyperplasia. The same changes take place in the parauterine and periuterine elastic fibers. When involution fails to occur and subinvolution persists for a long time, then, in addition to subinvolution of the muscle fibers, there occurs a marked increase in the elastic and fibrous connective tissue. There finally results an end-stage, which is characterized by an enlarged, hard, brittle uterus, associated with which is an inelasticity of the blood-vessels and often an arteriosclerosis of the blood-vessels. In such a fibrosis there is a hyperplasia of the connective tissue, the elastic elements are thickened, and there is an increased amount of fibrous connective tissue. In the connective tissue around the uterus, in the broad ligaments, and in the connective tissue between the bladder and the uterus, there are large dilated veins. In the broad ligaments there are plexuses of varicose veins.

The tendency to the production of fibrosis is increased by numerous labors occurring in rapid succession, by retroflexion

occurring after labor, by inability to nurse, and by the performance of physical labor. As a result of the subinvolution and of the frequent pregnancies such uteri are hard, enlarged, and firm. They grate on cutting. Such uteri have poorly conditioned muscle fibers, and are composed of much fibrous connective tissue and of numerous elastic fibers poor in contractile power. This uterine alteration is a very frequent cause of menorrhagia and also of metrorrhagia, and causes very frequently, toward the age of the normal climacterium, such a lack of contractile power in the uterus, with or without arteriosclerosis of the vessels, that extremely profuse bleedings occur. Often a hysterectomy or radiotherapy may be necessary, for even curettage sometimes fails to stop the bleedings.

Inflammatory Metritis.—In contradistinction to such a simple subinvolution fibrosis, the uterus may be thickened, hypertrophied, sclerotic, or enlarged as a result of chronic inflammatory changes in the uterine lining and wall. This is an inflammatory termination of a real inflammatory metritis. As a rule, the distinction is not made between such alterations due to inflammation and similar changes due to failure of involution on the part of a uterus. The latter is generally considered under the heading of metritis. If the term metritis is to be used for inflammatory cases, then the end-stage of subinvolution should be called non-inflammatory metritis or fibrous uteri. (See Metritis.)

Pelvic Subinvolution.—Subinvolution of the uterus itself is often only of secondary importance. Of far greater significance are the condition, size, and elasticity of the ligaments about the uterus. These ligaments, filled with elastic connective tissue and muscle fibers, are responsible in a very great measure for retaining the uterus in its normal position. The elastic fibers and the connective tissue about the vagina, bladder, etc., are of great importance in retaining these organs in their normal situation. There occurs very frequently after one or more labors a failure of these ligaments to regain their tonicity. They remain elongated, inelastic, flabby, resulting in *descent of the uterus*, with or without retroversion and retroflexion, descent of the posterior wall of the vagina, descent of the vagina, etc.

Of great importance in this connection is the condition of the levator ani muscles and of the muscles in the perineum. Much has been said of the effect of perineal laceration on the production of cystocele and descent of the uterus. It is a fact that even deep median laceration of the perineum which does not tear the insertion of the levator ani fibers is not productive *per se* of descent of the vagina. That with lateral laceration of the levator ani such conditions do occur, can be readily understood, when we consider the insertion of the levator ani fibers to the rami of the pubis, their close anatomic relation to the lateral walls of the lower part of the vagina, and their insertion about the rectum, anus, and coccyx. Subinvolution or laceration of these muscles, which form so important a part of the pelvic floor, is productive of a loosening from their normal situation of the bladder and vagina. But these alterations of position on the part of the bladder and vagina are as much due to atrophy or subinvolution of the connective tissues as to the injuries to the muscle fibers.

Constitutional Subinvolution.—The condition which we finally observe constitutes a ptosis of the genital structures, to which the name of hysteroptosis may well be given. The name *hysteroptosis* is of special significance, for in the majority of these cases there is also a ptosis of other abdominal structures. It is natural to expect that the abdominal wall which does not return to a normal condition of elasticity, in which the recti are abnormally attenuated, in which the fasciæ of the abdominal wall are overstretched, will fail to transmit proper intra-abdominal pressure and in this way fail to aid in sustaining the intra-abdominal organs in their normal position. But this is not the only important factor. The same failure on the part of the supports of the intestines and stomach to return to their normal state of elasticity, the inelasticity or atrophy of the connective tissues, fibrosis of the elastic fibers in these structures, and the disappearance of fat about the kidneys, are important elements which cause enteroptosis, gastro-enteroptosis, and movable kidney. Probably half of the patients with gastro-enteroptosis have a retroverted or a retroflexed uterus. With or without relaxation of the abdominal wall, with or

without displacements of the intra-abdominal organs, there exists, too, for weeks, months, and often for years, a condition of intra-abdominal congestion in which the important blood-channels of the intra-abdominal cavity are distended with stagnated blood, with consequent failure of proper blood-supply of the important secretory organs, and so resulting in altered functions of the stomach and intestine in particular. Associated therewith is a heavy dragging sensation, indefinite pains in the stomach and abdominal cavity, backache, feeling of weakness, indigestion, constipation, and malnutrition.

This condition, while a local one, is markedly dependent on the lack of tone in the general circulatory apparatus. This is a state which occurs not only in women who have been pregnant, but also as a general condition, often to be referred back to rickets in childhood, to the sequelæ of various infectious diseases, to the influence of chlorosis and anemia.

Albu has examined a great number of youthful individuals and children with reference to the occurrence of visceroptosis. In fact, irrespective of the causes usually accepted in the possible etiology of this condition, he concludes that in a large majority of cases visceroptosis is a congenital anomaly, which is latent so far as the symptoms are concerned, until contributory factors increase the abnormalities of sensation and of function caused by the existence of ptosis. Visceroptosis accompanies a certain formation of the body, characterized by excessive development in the long axis with imperfect development of the framework in the direction of breadth and depth. The whole figure inclines to be angular, and among the bony irregularities accompanying this type of body we find a narrow, flat thorax with stenosis of the upper thorax aperture and a freely floating tenth rib. The superficial coverings of the body show diminished panniculus adiposus and a flaccid weak musculature, especially evident in the abdomen. The frequency of this congenital anomaly has been increased in the modern age by various abnormal conditions of life leading to mal-nutrition and to exhaustion of individuals, whose children are then much more apt to show congenital deformities. The prophylaxis of

visceroptosis lies in the improvement of general hygienic and social conditions.

A condition of this sort is very frequently acquired by women who have been pregnant, and it is, of course, especially aggravated in those patients in whom the etiologic factors just mentioned have been present and in whom there is a tendency to splanchnoptosis before marriage. There is a sluggish circulation of blood throughout the entire system and a failure of proper nutrition of the various organs of the body. There is improper oxidation of tissue. A sensation of general languor and lassitude, a lack of energy and tone are characteristic. Combined with this lack of general circulatory tone is a somewhat analagous condition in the nervous system. There is physical and mental asthenia; in other words, neurasthenia is the predominant condition. These patients suffer from palpitation of the heart, are weak and tired, suffer from indigestion and constipation, sleep is disturbed or irregular, and there is restlessness. Patients cry easily and often show a lack of mental poise and stability. This condition may well be described as one of *constitutional subinvolution.*

Splanchnic Neurasthenia.—"There are a large number of gastric and intestinal affections with bizarre and protean symptoms designated as gastric and intestinal neuroses, but which in reality owe their genesis to the congestion of the intra-abdominal veins." "The greater the intra-abdominal tension, the less blood will be contained in the intra-abdominal veins." "This tension is largely dependent on the tone or tension of the abdominal muscles. Therefore, nervous exhaustion is a frequent cause of diminished tone of the abdominal muscles, which in turn decreases intra-abdominal tension and conduces to blood stagnation in the veins of the abdomen." "Venous congestion interferes with a proper supply of arterial blood. The tissues and the organs bathed in pools of stagnant blood are practically in a state of asphyxia. The toxic products of digestion, which are normally removed by an unimpeded circulation, have a specifically poisonous effect on the sympathetic system, a fact which is evident, owing to the frequent occurrence of depression, prostration, and nervous symptoms in

nearly all disorders of the alimentary canal." "Gastro-intestinal disturbances, of whatever nature, seriously compromise the integrity of the nervous system, either by inducing neurasthenia or aggravating it, if it exists."

"The entire question of splanchnic neurasthenia is one of abdominal plethora dependent on a variety of causes—notably diminished intra-abdominal tension, insufficient lung development, a defective vascular apparatus. Splanchnic neurasthenia is one of the few forms of neurasthenia amenable to permanent cure, by measures having for their object relief of abdominal venous congestion." "In any splanchnic neurasthenia existing as an independent affection, the relief of symptoms almost positively follows relief of the venous abdominal congestion" (Abrams).

There is certainly in many women a predisposition to the occurrence of abdominal or constitutional subinvolution. It is noted in women in whom there is a general inelasticity, an almost complete absence of fat, and a tendency to neurasthenia. Such women frequently have little energy. Even the greatest subsequent care fails to restore the various organs of the body to normal tone. This general state often occurs without the presence of an enlarged uterus. In fact, unduly prolonged nursing is a frequent cause.

Lactation Atrophy.—The changes occurring in lactation atrophy are a concentric atrophy of the uterus with a cavity of normal size but with a deficiency of muscular elements. These latter cases are frequently associated with small adnexa. The majority of nursing women who have a uterus of less than the normal size show all the evidences of poor nutrition, and especially laxity and flabbiness of the general body structures. In "prematurely aged women" lactation is debilitating. It is in these cases that Frommell finds the greatest amount of uterine atrophy, and he supposes this to be evidence that nursing deprives the body of a large amount of nutrition.

Thorne considers lactation atrophy to be a reflex trophoneurosis, and believes that every nursing amenorrheic woman has a hyper-involuted uterus, without, however, an involvement of the ovaries. He acknowledges the frequency of anemic

conditions associated therewith, but observes that those cases menstruating during nursing show no atrophy of the uterus. This associated menstruation is an evidence of sufficient ovarian stimulation.

This condition of *abdominal and constitutional subinvolution* explains in many cases the relation so long, and even still, held to exist through reflex channels between cervical lacerations, cervical erosions, cervical catarrh, uterine catarrh, and especially uterine retroversions and flexions, on the one hand, and certain nervous phenomena on the other. In many instances the nervous condition is due to alterations in the ovary produced by tubo-ovarian, ovarian, and peritoneal complications, which complications are generally the result of an upward extension of a cervico-uterine infection. These ovarian lesions may be simply that mild infection of the follicles which leads to the formation of so-called "cystic ovaries." The ovarian changes may be sclerotic in their character, resulting from mild tubal and peritoneal infecting lesions and from a mild paraoöphoritis or parasalpingitis. The inflammatory changes in the ovary may be a chronic form, producing alterations not always easily classified, but interfering with the secretory work of these glands and causing ovarian dysmenorrhea. Aside from inflammation, congestion and improper circulation may interfere with the proper function of the ovaries. Hence pelvic and abdominal subinvolution may cause such functional ovarian changes as are symptomless so far as pain, or marked pain, is concerned. Even changes in the menstrual regularity or in the menstrual amount may be slight or absent; changes from the normal are often present. The important end-effect is an interference with the proper secretory function of the ovaries.

Hyperthyroidism.—Many patients complain of increased nervousness following childbirth. Of course, among such instances are nervous conditions due to various other causes and tendencies. A certain proportion of such nervous patients are, however, undoubtedly suffering from what is known as hyperthyroidism. Cases of hyperthyroidism may occur without local thyroid changes upon which we can place the tangible responsibility. These are due to a faulty relation between the

ovarian secretion, on the one hand, and the thyroid secretion, on the other. An altered or diminished ovarian secretion results in a relative increase of secretion from the thyroid. The consequent symptoms vary from nervousness and irritability to symptoms which include sleeplessness, palpitation, rapid pulse, diarrhea, flushes, etc., but without any exophthalmos, goiter, or marked tachycardia, or else with exophthalmos of varying degrees, or goiter more or less marked, or both. It is important to recognize the fact that Basedow's disease frequently occurs in an aberrant form, and that the cases shade down gradually to forms which, since exophthalmos, goiter, and marked tachycardia are absent, are to be called hyperthyroidism. Many such patients are found to have cystic ovaries, sclerotic ovaries, or other pathologic non-recognizable ovarian changes. Thus relative hyperthyroidism produces a group of symptoms like the nervous symptoms of the typical menopause or climacterium, except for the fact that flushes or flashes are less marked or absent. These cases can be identified by the basal metabolism test.

Post-partum Treatment and Prophylaxis.—A contributing factor in the causation of these conditions of subinvolution and hyperthyroidism is lack of proper care in the post-partum stage. During this period the patient should be examined from time to time, and every effort made to restore the uterus and its ligaments to normal. Abdominal massage will help the abdominal walls, deep abdominal massage will stimulate the colon and intestines. Anemia must be corrected by tonics and Nauheim baths should restore the circulation and the nervous system to its proper balance.

Within a few hours after labor the patient should be encouraged to lie mostly on the right or left side and not on her back. After the flow of milk has been established and the uterus is in the true pelvis, the patient should spend an hour every morning and an hour every afternoon lying flat on her stomach, and should sleep in this position a part of each night. A tight abdominal binder is not to be used, a comfortable binder being all that is necessary. Intestinal distention should be prevented. At all times the bladder should be emptied at

intervals of six hours. After the fifth day, patients may use a commode at the bedside. They may be allowed to sit up on the fifth or sixth day for a short time, increasing the period daily so that the patient can be out of bed on the eighth to the tenth day, provided there has been no temperature reaction. Toward the end of the second week or in the beginning of the third week, a course of baths should be begun containing at first salt, then salt and calcium chlorid, and finally carbonic acid gas should be added. Internal examination should then determine the position of the uterus. If there is any appreciable retroversion or retroflexion, or a noticeable tendency to descent of the uterus, a pessary can be introduced or else the vagina may be packed three times a week with gauze and glycerin, to give the uterus and the connective tissue elevating support. The return of the uterus to its normal size should be aided by the use of ergotol, 15 minims, three to five times daily, if a flow of milk has not been established. Daily intramuscular injections of 5 minims of pituitrin are also useful. Lifting should be avoided. If the abdominal walls fail to regain their normal tonicity promptly, superficial and deep abdominal massage should be given, an

Fig. 134.—The best auto-exercise for getting the recti and abdominal muscles into good condition. The patient, with body held rigid and chest thrown out, raises herself slowly from lying to seated position and slowly then returns to the flat position. This is repeated for from ten to fifteen times morning and night, beginning on the twelfth to fifteenth day and continued for several weeks.

abdominal belt applied and worn, and exercises carried out (Figs. 107, 134, 135).

The two best exercises are pictured in Figs. 134 and 135.

Treatment should be devoted rather to the prevention of these conditions than to their cure, for if once the uterus undergoes a fibrotic change, if the ligaments of the pelvis and in the abdomen are not early restored to normal tone, treatment is then limited to giving support by mechanical means to the uterus, to the abdominal walls, and to the intra-abdominal

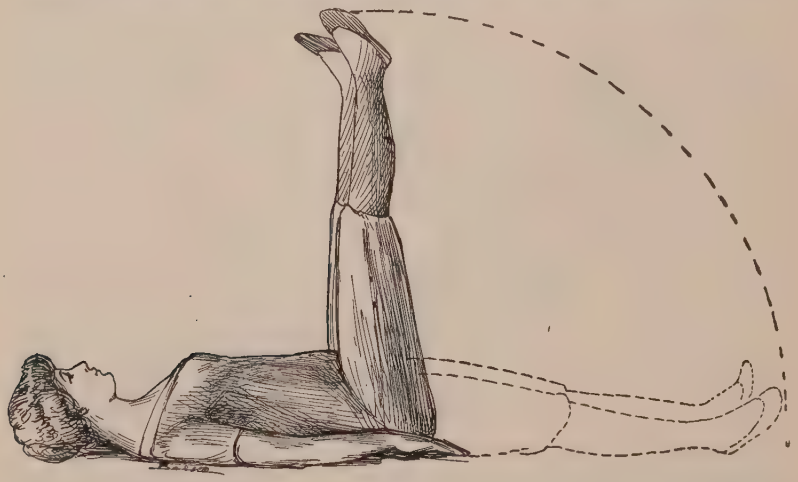


Fig. 135.—The patient lies on her back, holds her legs together and straight, and then slowly lifts them, without bending the knees, to the perpendicular position, and then slowly lets them down to the flat position. This is repeated for from four to ten times morning and night after the exercise shown in Fig. 134 has been continued for a week, when it is continued in conjunction with exercise shown in Fig. 134.

organs. When impairments of the general circulation are given early and systematic attention in the puerperal period, such treatment is extremely efficacious in avoiding either constitutional subinvolution or hyperthyroidism. The longer such conditions exist before treatment, the more difficult they are to correct, for the patients lose their courage, acquire fixed ideas and phobias, and since the sequelæ came on after labor, are finally of the opinion that a genital condition is at fault, and feel certain that only an operation will be of any value. It is just in this class of cases that operations done for

the correction of displacements of the uterus, for the correction of cystocele and perineal lacerations, for the fixation of movable kidneys, etc., fail of their purpose, because such operations do not relieve the basic general asthenic condition of the patient.

In the treatment of those cases with pelvic, abdominal, and constitutional subinvolution already established, attention must be paid to the pelvic congestion, to the bleedings, to the tonicity of the uterine ligaments, to the abdominal wall and to the organs within the abdomen, to the general circulation, and to the condition of the nervous system.

It has been demonstrated that 30 per cent. or more of women who come for a general physical examination evidence a right kidney so movable that the entire organ can be palpated. This condition is so common and so seldom gives rise to symptoms that it cannot be regarded as pathologic. In spite of this fact, however, many of the cases are improperly subjected to an operation to fix the kidney and cure the patient of a long train of vague symptoms which have been attributed to these slightly movable kidneys. Results have shown that these symptoms persist after operation. Most frequently operations are done to fix one or both kidneys if movability was but one of the evidences of visceroptosis. The operation of nephropexy is of distinct value in only a slight number of cases. These are cases of extreme mobility *with definite symptoms*, such as Dietl's crises, due to temporary distortion of the ureter, or marked pain and distress, which can be distinctly traced to the misplacement of the kidney. The operation of kidney fixation is now rarely done (Bevan).

So far as the uterus is concerned, it is wise to use the glycerin treatment with gauze, or gauze packed into the fornices and followed later by the pessary, supplemented by the use of short hot vaginal douches. As regards the abdominal walls and ptosis of the intra-abdominal organs, abdominal massage, diet for the correction of obstipation, exercise directed to the strengthening of the abdominal walls, an abdominal belt or Rose's bandage, and hydrotherapy, most easily administered in the form of the Nauheim baths are all useful. So far as the use of drugs is concerned, those given for their effect on the nervous

system and for their effect on the blood are indicated. For the former purpose a combination of bromid of strontium and sodium glycerophosphate is the best (p. 515). For the latter a combination of iron, arsenic, and ovarin is of value, often combined with cascara (pp. 299, 505). Daily hypodermic injections of iron arsenite and strychnine are extremely useful.

These cases are often associated with bleedings. They demand the use of douches, electricity, and sitz-baths for the production of uterine and pelvic anemia, and the drugs mentioned in the section on Uterine Bleedings. Mammary extract (gr. v–x t. i. d.), Thymus extract (gr. v–x t. i. d.), Pituitary anterior (gr. v–x t. i. d.), Placental extract (gr. v–x t. i. d.), or various combinations in appropriate and modified doses, represent the endocrine preparations best suited for the comfort of menorrhagia and metrorrhagia. Ergotin and Stypticin may often be added. If Ergotin or Mammary extract increase the bleeding at first, and this increase be more than temporary, they should be discontinued. (See also Section on Myometrial Degeneration, etc., p. 799.) In giving the Nauheim baths, care is to be taken to avoid in these cases even a temporary exaggeration of the bleedings. Restoration of a normal circulation is followed by benefit, and the ovaries and the nervous system participate in this nutritional alteration.

MALPOSITION OF THE UTERUS AND VAGINA

An altered *position* of the uterus implies a change in location of the entire, normally curved uterus with regard to its normal anatomic relations to the cavity of the pelvis. The entire uterus may be nearer the symphysis, or may be situated further back than normally and nearer the hollow of the sacrum (*retrodisplacement*). It may be descended or it may be prolapsed.

Anteposition of the uterus is produced by a retrouterine tumor of the tube or ovary, by hematocele in the cul-de-sac of Douglas, or by a peritoneal exudate situated in the same place.

Retroposition or retrodisplacement of the uterus means that the whole uterus is nearer the posterior pelvic wall, that the fundus is in the hollow of the sacrum under the sacral promontory, and that the normal anteflexion of the uterus is retained. The uterus may be pulled back into this position by adhesions in the cul-de-sac of Douglas resulting from hematocele or from a pelvic peritonitis, but occurs most frequently through the sclerosis and retraction of the uterosacral ligaments and the posterior paramentrium produced by a posterior parametritis. The most prominent symptom is severe backache.

A lateroposition of the uterus means that the uterus is pulled or pushed toward the right or left pelvic wall. This is produced by tumors of the adnexa, especially by intraligamentous tumors. A recent intraligamentous hematoma or a parametritis with exudation will push the uterus toward the other side, whereas an old sclerosing parametritis may pull the cervix or the fundus toward its own side.

Hysteroptosis.—A certain degree of ptosis of the uterus precedes the production of an acquired retroversion or retroflexion. Ptosis of the uterus with descensus vaginæ means that the anterior wall of the vagina or the posterior wall of the vagina or both walls are descended in association with a marked descent of the uterus. If the uterus is descended down to the vulva,

such a hysteroptosis is called a *descensus*, and implies a preliminary retrodeviation.

If the uterus extends beyond the vulva, the condition is called a *prolapse*.

Primary descensus and prolapsus uteri are due to inelasticity and stretching of the ligaments connected with the uterus and to inelasticity of the pelvic connective tissue.

In the *primary form* the upper part of the vagina preserves its roof or fornix anteriorly, posteriorly, and laterally and the cervix is not elongated. In the *secondary descensus* associated with elongation of the cervix there is inelasticity of the uterine ligaments, and especially inelasticity of the connective tissue about the vagina. The vaginal walls descend, pull on the uterus, drag it down, and elongate the cervix. The uterus when measured by the sound is increased in length, the rounded roof of the fornix is absent, and the upper part of the vagina is angular and hugs the cervix closely.

Küstner believes that the uterus cannot leave the pelvis or the vagina if situated in physiologic anteflexion. He contends that it must first come into a position in which its axis has almost the same direction as that of the vagina. A retroversion or slight retroflexion then permits abdominal pressure to cause a descensus of varying degrees. The nearer the portio approaches the vulva, the more is the vaginal canal shortened, and so finally lies outside the vulva as a prolapsus vaginæ, a condition so often combined with a retroversio flexio. He thus expects prolapse of the uterus and vagina to result after the retroversio flexio.

Prolapsus Vaginæ.—Any pronounced descent of the uterus is accompanied by a descent of the vault of the vagina. It must be noted that in addition to this descent of the vault of the vagina, even though slight, the lower end of the vagina often protrudes with a descensus uteri.

Although the presence of a retroflexio versio may make it easier for a prolapse of the vagina to occur, yet Veit considers prolapse of the vagina an independent affection, and considers the vaginal wall to be the factor which pulls the uterus out of its normal position. Controverting this latter view of the cause of descensus uteri in many cases it may be said that anatomic

considerations and surgical experience prove that the parametrium, *when normal*, is of such a character that a prolapse of the vagina is, of itself, incapable of pulling down or displacing the uterus.

Descensus uteri and prolapse of the vagina, though often combined, are two independent affections. The fact that the two are often coexistent is no proof that one is always associated with the other. Either may occur independently. They are due to the same cause, *i.e.*, injury during labor, and subinvolution. Atrophy or degeneration of certain tissues about the vagina may cause the mucous membrane to lie in folds, as is so frequently the case at the climacterium, when there is a resorption of fat and a change in the connective tissue, a disappearance of active elastic fibers, and a loosening of the various related structures. Such changes not infrequently occur, too, in younger women. In addition, there is a frequent congenital malformation, whereby the lower end of the vagina, the hymen, and the external genitalia, extend beyond the rami of the pubis, constituting a congenital elongation of the vagina. This form, slight in nulliparæ, is often greatly increased in multiparæ, and constitutes a true prolapsus vaginæ. Such a condition of the lower half of the posterior vaginal wall, due to perineal laceration, is not a rectocele unless it contains part of the rectum.

TREATMENT

A certain degree of hysteroptosis is responsible for the acquired forms of retrodeviation. The cervix has descended downward and forward in the pelvis, has approached the symphysis, and the fundus falls backward, since the uterus is no longer horizontal when the woman stands up. The pessary corrects a retroflexion or retroversion because it holds the cervix high up and far back toward the sacrum, hence the fundus readily stays forward.

There are many cases of hysteroptosis without retroversion or, especially, retroflexion. In spite of descent of the cervix the fundus is held forward by the round ligaments, the broad ligaments, or by its own rigidity at the internal os. There is ptosis, but no version or flexion toward the sacrum. One hundred

women with an uncomplicated hysteroptosis of this type will furnish just as many cases of backache, hypersecretion, and "reflex symptoms" as will one hundred cases of uncomplicated retrodeviations. The retrodeviation of the fundus *per se* is of no moment in the production of symptoms. Hence some of these cases of hysteroptosis are greatly benefited by treatment which lifts up the uterus, which diminishes uterine and pelvic congestion, and which involutes the ligaments.

Intravaginal pressure-therapy and the pessary are important. General treatment is essential. (See Subinvolution.)

In the more severe degrees of hysteroptosis with which a retrodeviation is always associated, a pessary may lift up the uterus and hold it in place provided the vaginal walls are not too relaxed and the levator ani muscles retain some of their elasticity. In some cases round rubber or wooden rings or the Menge pessary (Fig. 102) serve to support the uterus and relieve the dragging sensation. Rest in bed and thorough packing of the vagina with gauze and glycerin will have a beneficial effect on some cases and will restore them to a state where pessaries will be of aid.

Otherwise a satisfactory operation for the correction of descensus uteri and prolapsus uteri in women who are to bear no more children is vagino-fixation, an especially valuable operation because it permanently corrects the associated cystocele or prevents its occurrence if not present with hysteroptosis.

Retrodisplacement is a frequent malposition of the uterus. Occasionally it is a congenital condition, and if it causes annoyance it should be put into normal position by a pessary after preliminary treatment by intravaginal pressure-therapy to first lengthen the congenitally short uterosacral ligaments. In these cases the vagina is unusually long.

Acquired retrodisplacement is the result of a sclerosing posterior parametritis, and among other pains, felt during or between menstruation, is the constant backache and discomfort on defecation. The anteflexed uterus lies in the hollow of the sacrum. These cases can be much benefited by repeated treatment with glycerin and gauze, packed thoroughly into the

posterior fornix and left in place for twenty-four hours. Prolonged hot vaginal douches are taken daily and a twenty-minute hot sitz-bath is taken at night. These soften and make succulent the sclerosed connective tissue and the uterosacral ligaments. Later on, vagino-abdominal massage is done gently and steadily for two to five minutes twice a week, followed by the introduction of glycerin and gauze (Figs. 105,106). In the course of a few weeks the uterus is made so freely movable that a pessary can be introduced and the uterus is held in normal position. Such cases are frequent and furnish a class of patients whose symptoms can be markedly relieved. This acquired condition is the result of an old, very long-continued cervical catarrh and with it a large hypertrophied cervix is often present.

VAGINAL HERNIAS

While they do not constitute affections which markedly affect the comfort of the patient, vaginal hernias, especially the two common forms (*cystocele and rectocele*), are often complicated by annoying symptoms, conditions, and states. The origin, prophylaxis, and importance of vaginal hernias are not subjects of general agreement. Dependent as they are on the injuries and lesions consequent on labor, and evidencing their presence, as a rule, long after the same, various views as to the origin of anterior vaginal hernias have been based on the presence of uterine displacements and perineal lacerations, while theories of an uncertain character have served to settle the etiology of rectocele.

The connection between perineal lacerations and rectocele, for instance, is generally discussed without due attention to the important muscular lesions which produce these affections. Therefore, the frequency with which decided perineal lacerations are not followed by rectocele must have been noted by all close observers. For a long period the value of the perineum and the relation of its injuries to the condition known as cystocele have also been erroneously estimated. Most striking, from a clinical aspect, is the disproportion between the evident affection and the symptoms in numerous cases. External injuries afford no criterion as to the state of the deeper tissues of the pelvis or to the annoyances the patient suffers or may feel later on. The so frequent correction of these external hernias without due attention to pelvic lesions, the correction of uterine malposition without preliminary or subsequent treatment of the other pelvic pathological conditions, which may not be characterized by digitally evident lesions, are therefore not always followed by results satisfactory to the patient.

Just as hysteroptosis and prolapsus vaginæ should be considered affections independent of each other, although their etiology is the same, so prolapsus vaginæ and the various forms

of vaginal hernia should be differentiated. The name *cystocele* is generally applied to any protrusion of the mucous membrane of the anterior vaginal wall extending through the external opening of the vagina, and which is either externally visible or actually extends beyond the external genitalia. Such a condition, however, may be a congenital elongation of the vagina, a prolapsus vaginæ, or a true cystocele. A close distinction is often not made and the two latter terms are sometimes applied indiscriminately.

Anatomic Relations of the Vagina and Bladder.—Prolapsus vaginæ and cyctocele must be distinguished, for a cystocele constitutes simply a hernia of the bladder, as may be seen from a study of the anatomic structures. Cystocele, too, is independent in its origin of uterine displacements. I am reminded of an old case of decided cystocele, in a woman fifty-five years old which had pulled down the anterior fornix, so that this area, too, was a part of the cystocele covering. Tugging had elongated the anterior lip of the cervix at least one inch, and yet the uterus was in normal position and not descended. On the upper portion of the cystocele wall intestines could be felt, for the bladder connections with the cervix were entirely loosened. No rectocele was present and no descent of the posterior or lateral vaginal walls.

There may be: (1) Cystocele with a normally situated uterus; (2) cystocele with a hysteroptosis; (3) cystocele with a retrodeviated uterus; (4) cystocele with a hysteroptosis plus a retrodeviation of the uterus. In addition, a rectocele may or may not be present.

The diaphragm of the pelvis is formed of the levatores ani and the musculus coccygeus, and is perforated by the rectum, the vagina, and the urethra. The rectum is the only one of these three canals really united to the levator ani.

A muscular connection for the urethra and the vagina begins only when they pass through the trigonum urogenitale.

The vagina at its outlet is surrounded by the musculus bulbocavernosus, which is attached posteriorly to the centrum perineale, and which anteriorly surrounds the corpus clitoridis. It is called the constrictor cunni. The pars anterior of the

musculus trigoni urogenitalis is situated at the sides of the vagina, its fibers crossing anteriorly in front of the urethra, forming the compressor urethræ. The pars media of the muscle consists of circular fibers, arranged about the vagina and the urethra. Higher up the fibers do not unite behind the vagina, but do unite about the urethra alone.

The vagina penetrates the diaphragm of the pelvis in the middle of its own length. On its upper surface is the vesicovaginal septum of connective tissue and its close connection with the urethra, the urethovaginal septum. Laterally it is bounded by a vessel plexus and connective tissue and by the levatores ani. Only at its lower end has it the above-mentioned intimate relations with muscle fibers. The important relations of the vagina are with the trigonum urogenitale and its muscle, the perineum, the septum urethrovaginale, and especially with the levatores ani.

The urethra in its lower two-thirds is firmly connected with the vagina. Laterally, on either side passes the levator ani. Lateral to it and surrounding it are the musculus trigoni urogenitalis and the musculus bulbocavernosus. Anterior to the urethra are the plexus venosus pudendalis and the trigonum urogenitale.

The bladder in the newly born is a tube narrowed above into the urachus, which, with the umbilical arteries, holds the bladder close to the anterior abdominal wall. In adults, after descent of the bladder, spaces are formed which are filled with fat. Before puberty the fundus of the bladder rests upon the cervix and the upper third of the vagina. In adults only the trigonum vesicæ rests on the vagina and probably upon the portio. Because of the absence of the prostate, the orificium internum urethræ lies deeper than in the male. Below the bladder are the symphysis, a body of fat, the pudendal plexus, and the urethra. Below and lateral to the bladder are connective tissues of the parametrium and the muscles of the pelvic floor, especially the levatores ani. In front of the bladder is found the fascia vesicæ, and the cavum Retzii filled with fat, in front of which is the transversalis fascia covering the posterior surface of the symphysis.

The bladder is held in place by the peritoneum, the fascia vesicæ, the ligamenta umbilicalia, the musculi pubovesicales, and the ligamenta pubovesicalia. It is supported by the vesicovaginal septum of connective tissue, connective tissue, fat, and the levator ani muscles. From a study of these relations (Waldeyer) it may be seen that the vagina, except at its outer end, is simply surrounded by connective tissue. The only thing which prevents the vagina from being pushed down by abdominal pressure is the action of the levator ani muscles and the character of its connection with the surrounding connective tissues. Atrophy or degeneration of these tissues causes the mucous membrane of the vagina to lie in folds, as is so frequently the case at the climacterium, and in younger women, too, when there is a resorption of fat, a change of connective tissue, a disappearance of active elastic fibers, and a loosening of the various relations. Such a condition affects the lateral wall of the vagina, primarily, to only a slight extent. It is only affected secondarily after prolapse of the anterior wall.

After pregnancy and labor there is a disturbance in the anatomic condition of the various structures of the pelvis. The levatores ani and constrictor cunni are decidedly stretched and often torn, and, as a result, the narrow vagina is widened and the original narrow slit becomes a large canal. There is a disappearance of fat and a flabbiness and edema of the connective tissues and of the ligaments—that is, subinvolution is observed. Such a condition in the anterioı wall, almost always a sequence of labor, permits the filled bladder, loosened from its fastenings, to descend and produce a protrusion of the weakened anterior vaginal wall through the injured levator ani and the connective-tissue floor, which, normally, support it in place. The lesions are similiar to those that occur in hernia in the linea alba of the abdominal wall.

Cystocele.—This tendency to flabbiness of the connective tissues is a frequent result of labor, and occurs most frequently in individuals who exhibit such a tendency as nulliparæ. Gastroptosis, gastroenteroptosis, and ren mobilis have been found to occur frequently in rachitic and neurasthenic individuals. I have referred to such cases evidencing even as nulliparæ a

decided tendency to a descent of the uterus and to flabbiness of the pelvic structures, and have referred to the frequency of their combination with abdominal ptoses. To this descent of the uterus, of whatever grade, because of its etiology, I have given, in conformity with the conditions existing in the abdomen, the name hysteroptosis. These patients especially, as well as others, show after labor every evidence of subinvolution, even if the uterus returns to its normal size. The ligaments of the pelvis and of the abdomen are loose, edematous, and flabby, and the muscles of the pelvic floor evidence the same characteristics. Most important, there has been an injury to the levator ani muscles and the musculus trigoni urogenitalis (especially in instrumental delivery) or else these muscles are subinvoluted. Naturally enough, as a result of the descent of the uterus, retroflexio versio is frequently present, and for this reason more attention has been paid to the displacement; it has been considered the etiologic factor in causing the subsequent changes, while the elements of local subinvolution and atrophy and predisposition to inelasticity and injury to the levatores ani have been overlooked.

With such cases, as well as with any other case of subinvolution of the pelvic structures, if there has been a stretching of the levator ani or a rupture of the same, a space is immediately formed which permits descent of the bladder through pressure upon the weak anterior vaginal wall. The edematous swelling of the urethral prominence and its protrusion into the vagina are the first evidences. Added to this, the same conditions of edema or atrophy exist in all the connective-tissue elements uniting the bladder with the symphysis and abdominal wall, with consequent loss of their support. The erect position, abdominal pressure in empyting the bladder and in defecation, plus the intra-abdominal ptosis, result eventually in a descent and hernia of the bladder. Perineal laceration with the supposed resulting absence of support of the anterior vaginal wall by the posterior wall has nothing to do with this hernia.

In catheterizing these cases of true cystocele it is perfectly evident that the bladder fills out the dilatation in the anterior

wall, and the bladder is no longer supported by the levatores ani of the two sides, which, normally, are close together along the urethra and the lower portion of the vaginal wall. In cystoscoping these cases it is readily seen that the bladder constitutes a hernia. It is not the descent of the vaginal wall which brings the bladder with it, but the weight of the filled bladder which dilates and stretches the subinvoluted anterior vaginal wall. I have, in numerous instances, found the uterus absolutely normal in situation and pulled down into the vagina only with difficulty, and yet the cystocele was pronounced.

Proof of the fact that the weight of the filled bladder is the cause, is shown by the frequent recurrence of a cystocele after anterior colporrhaphy, even though, in addition, a high perineum is restored by plastic operation with a resulting narrow vaginal canal.

Enterocele; Rectocele.—From the broad general class, prolapsus vaginæ, we must remove the following forms of vaginal hernia: (1) The most frequent, involving the lower half of the anterior vaginal wall, the so-called prolapsus vaginæ anterior, or, better and more appropriately termed in most cases, *cystocele*. (2) Prolapse of the upper third of the anterior vaginal wall through descent of the intestines (rare). It is possible only when the union between uterus and bladder has been disturbed. This condition constitutes an *enterocele vaginæ anterioris*. (3) Prolapse of the upper portion of the posterior vaginal wall through a descent of the intestines, or *enterocele vaginæ posterioris*. Here the position of the uterus and the lower half of the vagina may remain undisturbed. The upper part of the posterior vaginal wall, however, is pushed down by the intestines in the sac of Douglas. (4) A dilatation of the lower half of the posterior vaginal wall containing a diverticulum of the rectum—a true *rectocele*.

The various forms are usually combined. The lateral walls are rarely affected. In those conditions in which the uterus is normally elevated, in conjunction with these affections there may be an elongatio colli, extending even to the vulva. Such primary elongation of the cervix is rare. It results usually from tugging on the part of the bladder and vaginal wall.

The cervix is then very thin and atrophic; this is due either to atrophy after inflammation or to atrophy following the above tugging, and occurs only if the uterus was previously firmly fixed.

In accord with the fact that the etiology of acquired retroversio flexio is pelvic subinvolution, it is found that the most frequently noted form is cystocele with retrodeviation of the uterus. Next in frequency is cystocele, plus rectocele. The latter is due to laceration of the perineum and to injury to the perineal and rectal insertion of the levator ani. Least frequent, supposedly, is cystocele alone. My experience, however, shows the last form, existing alone, to be much more common than generally stated. A prolapse of the uterus with invagination of the vagina occurs most often after the climacterium, as a result of senile atrophy of the pelvic tissues.

Treatment.—For mild degrees of cystocele Skene's pessary (Fig. 101) may be tried. Sometimes a small Hodge or Smith pessary will be of aid. Occasionally a ring or Menge pessary is effective in supporting the uterus and lifting up the cystocele. Operative relief is the wisest. Even with shortening or fixation of the round ligaments or with ventral fixation a cystocele frequently recurs after anterior colporrhaphy. Two factors may be stated as certain: (1) The correction of a retroflexion by these methods, though advisable, is not essential in the correction of a cystocele; (2) treatment of the posterior wall of the vagina is not the essential factor in correcting the lesion in the anterior wall. Theilhaber treated surgically twenty-four patients, almost all of whom showed an elongatio colli. The anterior colporrhaphy consisted in making the excision extend far laterally, into healthy tissue. He resected the anterior vaginal wall up to the lateral wall, paying little or no attention to the posterior vaginal wall or to the perineum. Out of the twenty-four patients thus treated, twenty-two remained without recurrence; the other cases could not be traced. There were no recurrences, in spite of the fact that fifteen cases had retroflexed uteri which were not treated surgically.

The good results obtained by Theilhaber were due: (1) to so changing the character of the anterior vaginal wall that the

upper ends of the levator ani muscles were brought close together; (2) to narrowing the anterior wall of the vagina; and (3) to removing the thin urethrovaginal septum, and so closing the space on the under surface of the bladder, through which this organ formerly descended.

Another valuable method, and one which is of considerable importance, is the vaginosuspension or vaginofixation of the uterus according to the method of Dührssen. Although the value of the latter in the case of women past the child-bearing period is generally acknowledged, this favorable opinion as to the use of the former in younger women with cystocele who are to bear more children is not general. Without going into the question further, suffice it to say that the experience of Dührssen, since the perfection of his method, and my own experience in over one hundred selected cases, leave no room for criticism of this method of supporting the bladder. It is remarkable how slight are the vesical annoyances associated with cystocele. The patients simply feel a protrusion on standing or on straining and usually say "the womb is coming down." With rectocele, and its associated injury to the levator ani muscles, constipation and inability to force out the feces are the most noticeable complaints. There is a sensation of pelvic looseness. Senile vaginitis makes these conditions annoying. In the operative correction of rectocele it is essential to unite the torn rectal ends of the levator ani muscles.

Early Diagnosis of Pregnancy.—In the third or fourth months of pregnancy the introitus vaginæ is so typically dark blue that this condition is pathognomonic, but in the very early weeks there is only a slight bluish discoloration of the vaginal wall, especially on the urethral prominence. This is usually most distinct in multiparæ. In the early weeks of pregnancy the vagina and cervix become succulent and there is increased secretion. The cervix, as expected, shows the earliest cyanosis in early pregnancy, for this tinge of blue is frequently present just before menstruation also. The portio becomes softer, especially at its lower end. The most important sign is enlargement of the uterus, which becomes broader and thicker.

The uterus in the first three months grows faster than does the ovum because it grows in part independently of the ovum. At the fourth month, when the cavity of the uterus is obliterated by the union of decidua reflexa with decidua vera, the growth of the ovum causes growth of the uterus. The uterus becomes continually softer, so that in the fourth month it is sometimes so soft that the fundus is not readily made out, and the error is frequently made of mistaking the portio for the uterus. The fundus when outlined may be mistaken for a cystic tumor. This error is due to the fact that the line of division between the firm cervix and the extremely soft fundus is so soft that a connection between these two parts of the uterus does not seem to exist. In the earlier months also this area of softening is marked in the lower uterine segment, even if the cervix and fundus feel firm. If the internal examining fingers are placed in the anterior fornix, and if the external hand is passed over the posterior wall of the uterus until the tips of the fingers reach the region of the internal os, the tips of the external and internal fingers almost come into contact as if no uterine tissue were present. This means that the soft edematous

anterior and posterior walls of the lower uterine segment are neither of the firmness of the cervix nor of the cystic or firm character of the fundus. This condition, determined by bimanual examination, is one of the earliest positive signs of uterine pregnancy, and is called the sign of Hegar (Fig. 136).

In the early weeks of pregnancy in uniparæ or multiparæ a differential diagnosis must be made from chronic metritis and from fibrosis uteri. In these states the uterus is enlarged

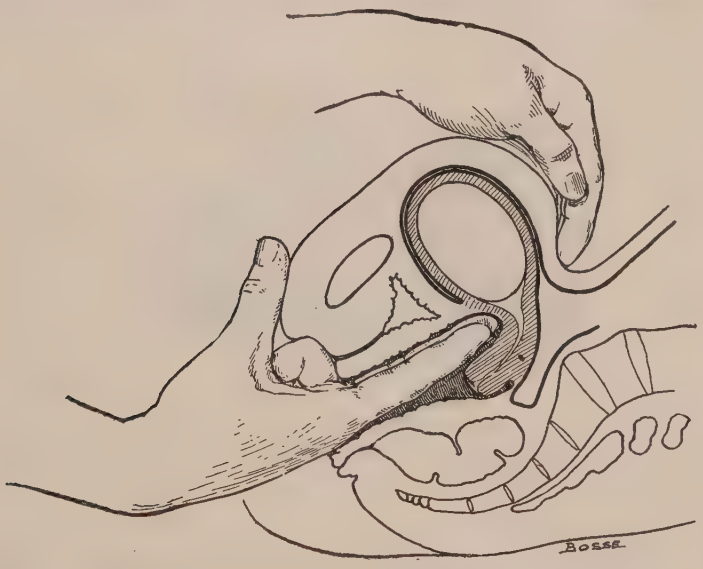


Fig. 136.—The method of determining that softness of the cervix at the region of the internal os known as Hegar's sign. It often seems to the examining fingers as if the cervix and the soft fundus were not connected at all.

and may occasionally be soft. The cervix may be soft in conjunction with fungoid hyperplasia of the endometrium, so that the differential diagnosis from pregnancy in the first two months is often difficult. There is, however, no blueness of the introitus or of the vagina and there is no sign of Hegar. There is usually no history of amenorrhea except in nursing women, and in them the uterus is small. A definite diagnosis can be made by noting the growth of the uterus after an interval of two or four weeks. Asymmetry of the two cornua is an important sign, the uterus changing in size and outline during examination.

Embedding of the Ovum.—A fecundated ovum shows upon its outer surface a development of cells known as trophoblast cells. It is from these trophoblast cells that the covering of the future chorionic villi and the placenta are formed. The characteristic of the trophoblast cells is that by enzyme action they burrow their way into the decidua, digest the tissues in their periphery, perforate the blood-vessels, and thus receive their nutrition from the maternal circulation. These cells form the two-layered covering of the villi, the syncytium and the cells of Langhans. The uterine lining develops into decidua

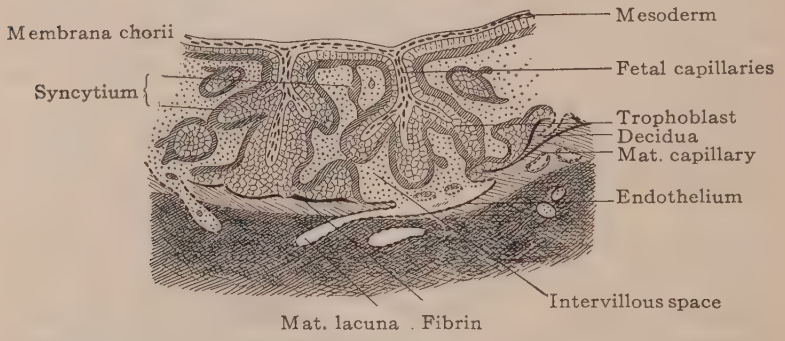


Fig. 137.—Diagrammatic representation of the formation of the villi; their structure of trophoblast cells, their covering of syncytium, and their delicate connection with the decidua, as well as the growth of trophoblast cells into the decidua (after Peters).

by a great hypertrophy of the connective-tissue cells, accompanied by dilatation of the vessels and congestion of the whole uterus. So delicate is the relation between the growing ovum and its trophoblast cells on the one hand, and the decidua and the maternal blood on the other, that the wonder is not that abortion takes place, but that it does not take place more frequently (Fig. 137).

Changes in Ovum.—Abnormalities in the ovum itself may be the cause of abortion. These abnormalities comprise a syphilitic change. It may be assumed, even though this cannot be verified in the early cast-off ovum, that an ovum made syphilitic produces an abnormal type of cells, and the viability of the little embryo is readily involved. If then, at a very early stage, there is death of the embryo, or if the cells from

which the chorionic villi and the future placenta are formed are not healthy ones, it is evident that the relation between ovum and decidua may be readily disturbed. The ovum then becomes a foreign body, uterine contractions take place, and abortion results. If in the early course of pregnancy, through any form of maldevelopment or through any form of involvement of the cord the embryo dies, abortion results. Any disease of the mother which results in an influx of toxic products may injure the ovum, cause the death of the embryo, and induce its expulsion.

Changes in Maternal Tissues.—The greater number of abortions, however, result from derangements of the maternal tissues. Here syphilis of the mother may be a factor, in that the processes of placental development are carried on in abnormal decidual tissues. There may be, in addition, a failure of proper nutrition of the ovum. Diseases associated with high temperature may destroy the embryo. If the mother is suffering from an infectious or other disease which produces toxins that poison the embryo or which alter the character of the endometrium, such diseases are potential causes of abortion. Endometritis implies an involvement of the uterine lining, inflammatory or non-inflammatory. It can be readily seen that an inflammatory involvement resulting in great congestion of the uterine mucosa, or resulting in atrophy of the uterine mucosa, with or without a change in the vessels, destroys the delicate balance between ovum and decidua or interferes with adequate nutrition of the fetal cells. Overgrown uterine mucosa in the form of hyperplasia, accompanied as it is with tendency to hemorrhage at menstruation and associated with dilated capillaries and vessels, causes free capillary hemorrhage. The growth of the trophoblast cells and the extension of the chorionic villi is supposed in every case to perforate capillaries; but if these capillaries are sclerotic or diseased, or if congestion is marked, too much blood is forced out and the ovum is loosened from its contact with the decidua serotina or perforates the *decidua reflexa*. This is perhaps the most frequent cause of abortion, especially of repeated abortions. An ovum which settles in the lower segment of the uterus and

which develops there will result eventually in the production of a placenta prævia. It is quite probable that many cases of abortion, especially in the early weeks, are instances of ova situated in the lower segment of the uterus, the part which is not intended for early stretching and growth, and for that reason uterine contractions take place to an unusual degree and the ovum is expelled. It is probable that placenta prævia indicates the existence of an abnormal endometrium, an endometrium which does not permit of the location of the ovum near the fundus, and for that reason results in its descent to the region of the internal os.

Changes in the Uterine Wall.—Changes in the uterine wall may be responsible for abortion. A uterus which is inflamed, which is hypertrophied as the result of sub-involution, accompanied as it is by congestion and arteriosclerosis, is either stimulated to undue contractions in the course of pregnancy or else is likely to bleed at the slightest provocation. Every uterus, whether pregnant or not, undergoes normal painless contractions, which is nature's method of keeping the uterine muscle in good condition. These painless contractions continue, and in the later months of pregnancy are known as the Braxton-Hicks painless contractions. An inflamed or sensitive uterus reacts by unusual contraction to the presence of the growing ovum, and if of sufficiently marked character, the result is hemorrhage and mechanical loosening of the ovum. We must consider hypoplasia of the uterus another cause of abortion, especially in first pregnancies. The uterus is then somewhat small, the decidua does not develop sufficiently, the uterine wall is thin, the necessary hypertrophy and hyperplasia of the uterine wall do not occur, the uterus does not grow proportionately, and abortion in the early months may take place.

There are abnormalities in the ovum which may result in abortion, either through their influence on the uterine wall or because they result in the death of the embryo. This refers particularly to the change known as hydatid mole. It is more than probable that many cases of abortion, especially those in which the ovum is thrown out as a whole, are microscopic early

forms of hydatid mole, which only microscopic examination can detect.

There are other conditions within the uterus of a rather unusual nature which are likewise the cause of abortion. A septate uterus is such a cause. An ovum here develops in only one-half of the uterus, its growth is limited by the septum, changes in blood-supply result, and abortion may take place.

Uterine polyps, and particularly unrecognized submucous fibroids, are productive of abortion. They produce bleeding or hemorrhage in the uterine mucosa or mechanically prevent the growth of the ovum and bring about uterine contractions which expel the growing ovum.

Displacement of the Uterus.—Displacements of the uterus, especially retroflexion, are considered to be a cause of abortion through the abnormal congestion which they produce and the consequent tendency to minute or greater bleeding. While this is true in some cases, yet pregnancy to full term in retroflexions is an almost every-day occurrence, while in other cases the correction of the displacement by pessary or operation fails to prevent subsequent abortion. Isolated single abortions are so frequent and occur for so many different reasons that the non-recurrence of this condition after the correction of retrodeviations should not be considered as absolute proof of the importance generally attached to uterine displacements, when endometritis and metritis and fibrosis are probably the important factors. Of course, a retroflexion should be corrected to prevent an incarceration of the uterus when pregnant, in the true pelvis, and to avoid the risk of future prolapse of the uterus. Physical injury and physical shock, etc., may produce abortion by mechanical action if they result in unusual hemorrhage from the vessels about the ovum, or produce a mechanical separation of some of the chorionic villi. Blood accumulates between the ovum and the uterine wall and the ovum is detached. Abortion produced by drugs or intrauterine manipulation is not considered here.

Symptoms.—The symptoms of abortion are bleeding, pain caused by uterine contractions and by dilatation of the cervix, and local evidences of an attempt at expulsion of the uterine

contents. The bleeding is either the primary or the secondary factor. It is primary if a hemorrhage takes place which acts as a mechanical agent in separating the ovum. It is secondary if the ovum dies or is partly separated, and, being then a foreign body, the uterus contracts in its attempts to expel it. Uterine contractions continue to separate the ovum, more bleeding takes place between ovum and decidua serotina, and blood is poured out of the cervix. The pain associated with abortion is due to uterine contractions and to cervical dilatation, and simulates to a minor degree the pains at full term. The uterus contracts close down upon the egg, blood accumulates in the uterus, the uterus contracts to expel the blood, and this process continues until the broken or unruptured ovum is entirely loosened from contact with the uterine wall. It is not alone the uterine contractions, but also the dilatation of the cervix which produce the pain. The degree of dilatation of the cervix, then, is one of the means of determining whether abortion is progressing or not. Given a uterus which is bleeding, in which pain is slight, and in which the cervix is not dilated, remedial measures may control the hemorrhage, and the progress of abortion. If, however, bleeding continues, it threatens the life of the ovum. If the blood is poured out rapidly and accumulates in the uterus in the form of clots, it stimulates the uterus to further contractions. If the ovum is partially separated from the uterine wall, or if the embryo is dead, the uterus naturally reacts by further contractions. Therefore the continuation of uterine pain and the increasing dilatation of the cervix are indices of an inevitable abortion.

In the bleedings which occur during pregnancy, involvement of the vagina, portio, and cervix can be excluded by examination. Regular bleeding may come from a double uterus. Bleeding from a pregnant uterus may occur as the result of an existing fungoid endometrium. There may be a long-continued oozing, especially of brownish blood mixed with mucus. There are recurring pains, but not of marked severity and not accompanied by the loss of much blood or by dilatation of the cervix. The bleeding comes from the lining of the uterus, from the decidua vera. An endometritis deciduæ (inflammatory) is a

frequent cause of habitual early abortion. *Ectopic gestation must always be considered and differentiated.*

An inevitable abortion is associated with the loss of much blood and of fresh blood, whereas irregular bleeding or the loss of brownish blood mixed with mucus does not indicate immediate danger. When, in addition to the loss of fresh blood, pains come on, this combination has a more direct meaning. If at the same time the uterus becomes more tense or becomes harder, it indicates that abortion is in progress. If, then, the cervix is open and the internal os admits one finger, this dilatation of the cervix is a most important sign of inevitable abortion.

Hegar's sign is important in early cases seen for the first time in whom pregnancy has not been previously diagnosed, especially so if there is a history of long-continued irregular menstrual periods and for the purpose of excluding *ectopic gestation*. An important aid is the introduction of the finger into the uterus when the cervix is open. In beginning abortion the finger feels the round ovum more or less cystic. In incomplete abortion the finger feels retained sac or decidua or retained placenta, which are recognized by the fact that they can be peeled off with the fingers. Sometimes such structures are seen projecting from the cervix.

Treatment.—The treatment of inevitable abortion consists in producing the steps involved in normal labor. In labor dilatation of the cervix is aided by uterine contractions which force the "bag of waters" into the cervix and, by the upward pull of the cervical fibers, around the presenting part of the child, as if pulled around a pulley. Continued uterine pains expel the contents, and further contractions of the uterus in the third stage loosen the placenta and expel it. Therefore the treatment of abortion consists in aiding dilatation of the cervix, in promoting the separation of the ovum and placenta, and in aiding the expulsion of the contents. At the same time the vital resistance of the patient should be conserved by limiting the hemorrhage as much as possible. The very means which are best adapted to preventing an excessive loss of blood happen to be the same measures which are of the greatest value in dilating the cervix. If an abortion is inevitable and if it is

desired to carry out the procedure in the simplest manner, the following should be done with strictest surgical aseptic precautions. The vulva, the vagina, and the cervix are thoroughly cleansed. With the aid of a bivalve speculum or of Sims specula the cervix should be grasped by volsellum forceps, and a long strip of iodoform gauze, its width depending on the dilatation of the cervix, introduced into the cervix and as much passed up into the uterus as possible. The cervix should then be packed as thoroughly as possible. The vagina, from the fornices to the introitus, should be packed with a very wide strip of iodoform gauze arranged in plaited form, thus furnishing a packing which completely and solidly fills the vaginal canal. With the aid of a T-bandage and gauze about the vulva the vaginal packing is easily kept in place. Ergot, dram 1, or ergotol, dram ½, should be administered every two or three hours. The vaginal packing prevents the exit of blood from the uterus and hemorrhage is limited. Through the gauze within the cervix, dilatation of the cervix is produced. As a result of the packing in the vagina and the cervix the blood thus poured out in the uterus is retained within it. Contraction of the uterus compresses this blood, the poured-out blood dilates the uterus and cervix, accumulates between the ovum and the uterine wall, and is an important factor in peeling the ovum away from its contact with the uterine wall. Contraction of the uterus and the effort of the uterus to expel the ovum and clotted blood dilate the cervix. If this packing is removed at the end of twenty-four hours, the cervix will be found considerably dilated. The same steps as mentioned above should be repeated, if necessary, but a wider piece of gauze can be packed into the uterus and especially into the cervix. The vagina is then thoroughly packed and the use of the ergot is continued. It rarely takes more than forty-eight hours with this method to dilate the cervix so that it readily admits the middle finger (Fig. 86). At the same time the ovum and the chorionic villi or placenta are often completely loosened from the uterine wall. The cessation of uterine pains can generally be taken as evidence of separation of the ovum. At the end of the forty-eight hours, then, the gauze is removed, and not infrequently the ovum is so situated

that placental forceps introduced into the cervix can grasp it and remove it—sometimes the fetal sac with the embryo, at other times the fetal sac and then the embryo.

If the placental forceps do not grasp the loosened contents, anesthesia is generally necessary, and the middle finger, under the strictest aseptic precautions, is introduced into the cervix and uterus; the other hand, pressing through the abdominal wall, pushes the uterus down into the pelvis and presses on the fundus (Fig. 86). In this way the middle finger of the internal hand can palpate the entire uterine cavity, can separate the whole ovum or the adherent parts or remove whatever of fetal sac or placenta is attached. After this procedure the placental forceps carefully introduced can extract whatever loosened contents are in the uterus. The uterus should then receive a very hot douche, with a double-running irrigator, of 1 per cent. lysol, or iodin, 1 dram of the tincture in 1 quart of water (Fig. 81). If the finger has been unable to separate any of the placental tissues, their location at least is noted, and placental forceps or a large blunt curet are then introduced for their removal. The uterus and vagina are packed with iodoform gauze and ergot is administered. Pituitrin, 15 minims is injected intramuscularly. The gauze is removed in from twenty-four to forty-eight hours and ergotol, 15 minims, is administered every four hours. In incomplete abortion it is rarely necessary to use the sharp curet unless, in very early cases, the uterus is so small that the finger method cannot be applied (Figs. 81, 82, 83). The use of the sharp curet is dangerous. First, we are never sure that we have removed all the products of conception; second, perforation of the uterus occurs very readily. During the manipulation of the curet the uterus dilates and contracts easily, as it does in the postpartum period at full term, and if the curet is held very firmly, simple contraction of the uterus is enough to cause perforation by this sharp instrument.

It is by no means infrequent to find in abortions at the tenth or twelfth week, when an embryo is spontaneously expelled, that decidua, the sac of the ovum, or placental remnants are retained. These, as a rule, prevent the uterus from returning

to normal size, the cervix does not contract, and there is generally a steady or irregular loss of blood. Under these circumstances the same method of dilatation of the cervix by iodoform gauze and of examination and cleansing of the cavity with the finger is advisable. If this procedure is not possible, the dull curet should be used with the greatest precaution (Figs. 81, 82, 83, 85). In using the curet in the uterus, it is essential to first measure the length of the uterine cavity with a sound, and then to place the index-finger of the right hand on the curet at a point which makes the distance from the tip of the curet to the finger a little less than the length of the uterine canal, as measured by the sound (Fig. 82). Curettage is then done, with the finger held firmly on this point, so that the instrument at no time enters further into the uterus than the measured length. The above described method of painless, slow dilatation of the cervix by the use of iodoform gauze is a safe and certain procedure. The above method of removing the contents of the uterus by the introduced finger is certainly the safest. The finger recognizes adherent tissues; it locates any tissue that cannot be scraped off; it is unlikely to perforate the uterus. It makes the diagnosis and carries out the treatment. It should be used in every case in which the uterus is three times the normal size. Otherwise, instead of curage, curettage must be done (Figs. 81, 82, 83).

The diagnosis of incomplete abortion is more difficult when the cervix is closed. The continuation of pain suggests the retention of the clots or of large masses, and bleeding continues. The uterus may be enlarged through the thickness of its own walls rather than through the size of its contents. The sound may detect irregularities or roughness, but its use causes bleeding. Winter says that the larger and softer the uterus, the more does it speak for the retention of fetal and decidual products.

The death and retention of the embryo and ovum in the first months of pregnancy result in a diminution of the succulence and blueness of the vagina and cervix. The uterus becomes harder. Bleeding is less frequent than in abortion. The important aid in diagnosis is observation of the fact that the uterus does

not increase in size in the course of several weeks, or that the uterus is much smaller than the length of the amenorrhea warrants. The chorionic villi may grow after the death of the embryo. Such an ovum is found to be covered by thickened decidua. Decidua serotina especially is hickened and infiltrated with blood. There is little amniotic fluid and the embryo may be present or degenerated. Such an ovum has been called bloody mole if fresh blood is present, and fleshy mole if decolorized old blood is present.

In some cases the entire placenta may be retained within the uterus. Bimanual examination shows a large uterus, often a dilated cervix, and the diagnosis generally made is submucous fibroid or chorioepithelioma. In fact, with a very adherent placenta, examination by the finger does not always make the differentiation. Such a placenta may be retained in the uterus a year or more, and if it undergoes no putrefactive changes the diagnosis is indeed difficult. More frequent is the retention of a decidua which does not undergo involution, but remains as a hypertrophied hyperplastic lining, giving rise to menorrhagia and repeated abortions.

Most frequent is retention of microscopic fetal cells in the form of villi or the cells which cover the villi, the cells of Langhans, and the syncytium. The most frequent causes of repeated abortion are syphilis, retroflexion, endometritis, fungoid endometrium, metritis and fibrosis uteri.

Abortion occurs most often in the third month, when the chorionic villi begin to atrophy, except at the serotina, the future placental site. The danger periods in repeated abortions are the omitted menstrual days, *i. e.*, the periods when menstruation would have occurred had no pregnancy taken place.

In bleeding occurring in the early months, when abortion is perhaps avoidable, the treatment consists of rest in bed, fluid diet, morphin by hypodermic or opium by suppository, and 2 grains of stypticin taken every two or three hours. Rest in bed is essential. For habitual abortion virburnum prunifolium should be given especially at the weeks corresponding to the omitted menstrual periods, and those weeks should be

spent in bed. Standing, lifting, and work should be avoided. It is wise to let a long period of rest, with treatment of uterine conditions, precede the next pregnancy if the patient comes for consultation in the non-pregnant state. Corpus luteum extract has been credited with correcting habitual abortion. The soluble aqueous extract, 1½ c.c., may be given intramuscularly every other day for several weeks, or the patient may be given a prescription for capsules, each containing 5 grains of the desiccated extract, to be taken before meals. Thyroid extract gr. $\frac{1}{10}$–$\frac{1}{6}$ t. i. d. should be given for months, unless the patient be hyperthyroid. Placental extract gr. v–x t. i. d. given for long periods may be of great help. Our purpose is to inhibit excessive pituitary action which is probably at fault in many cases. Atropine sulphate gr. $\frac{1}{600}$ t. i. d. may be used after the 6th or 7th month. Luminal gr. ¼ t. i. d. may be added. A syphilitic cure is essential if examination or history points to this etiology. The husband must be treated at the same time.

Infections result from bacteria present in the uterus (gonococcus) or introduced in attempts at induced abortion, or introduced through lack of most thorough aseptic precautions during examination or treatment. Putrefactive bacteria growing on retained products cause a sapremic endometritis with disagreeable odor. Streptococci, staphylococci, gonococci, etc., invade either the endometrium or the uterine wall, or extend out into the parametrium, the tubes, the peritoneum, or produce a thrombophlebitis or a general septicemia. Their treatment is described under Endometritis, Parametritis, Metritis, Salpingitis, Pelveo-peritonitis.

MYOMETRIAL DEGENERATION, FIBROSIS, AND ARTERIOSCLEROSIS

Causes of Uterine Hemorrhage.—In gynecologic hemorrhages, if those from the vulva, vagina, and portio vaginalis be excluded, visible bleedings are limited to the cervix and the uterus. Acute infections cause a certain amount of hemorrhage, but large losses of blood from the cervix are almost always due either to carcinoma, sarcoma, myoma, or polyps. The intact lining of the cervix does not bleed, as it does not participate in menstruation. A diseased lining of the cervix bleeds less frequently than the lining of the corpus uteri, for it takes but slight part in the physiologic swelling of menstruation.

Bleeding from the corpus uteri may be due to local conditions, to affections of the adnexa, to general physical disturbances, to nervous or temporary circulatory phenomena. The only normal uterine bleeding is menstruation. Every extremely profuse menstruation or every irregular bleeding must be viewed as pathologic. If the uterus on examination be found enlarged, the following conditions must be looked for: myoma or sarcoma of the uterine wall; carcinoma, sarcoma, or large polyp of the endometrium; chronic metritis with endometritis; the complications of pregnancy, such as endometritis, placenta prævia, abortion, retention of placenta or decidua, chorioepithelioma, subinvolution, ectopic gestation. If the uterus be not enlarged, there may be present endometritis or a malignant change, or a degeneration of the myometrium or ectopic gestation. If on examination with a sound the inner lining feels smooth and even, the endometrium is probably normal. Of the secondary hemorrhages from the uterus, a not infrequent cause is acute pyosalpinx. In this category, above all, extrauterine gestation must never be forgotten. Bleedings due to tumors of the ovary are rare, and if they do occur are usually the result of bilateral tumors, especially

carcinomata. The peritoneal causes of uterine bleedings come under the head of pelveo-peritonitis; in that case the associated endometritis and periuterine exudate are the probable causes. This holds true likewise of the bleedings complicating parametritis.

Climacteric Bleedings.—Among the other forms of decided uterine hemorrhage, the most important are the so-called bleedings of the menopause. At the climacterium a gradual disappearance of menstruation, becoming less and less at each period, is rare. Without a previous diminution in the amount of blood lost periodically the menses, as a rule, are absent for one or two periods; they then return at the regular time, usually increased. The interval between the individual bleedings is rarely more than five or six months. The loss of blood, as a rule, does not reach a dangerous amount, but these bleedings may occur often and last long. There may be at first a too early appearance of increased menstruation, and then later a delayed appearance of increased menstruation. In other cases there is a constant oozing of blood until the next flow appears. Even after a cessation of menstruation for half a year or a year, a bleeding may again occur, so that it is difficult to say when the end really comes. In such cases endometritis, myoma, and carcinoma must be excluded, for if after an absence of six or more months a bleeding occurs, it should be considered pathologic until proved otherwise. Not infrequently there occur at the natural climacteric age, and likewise much earlier, the so-called climacterium præcox, most decided and long-continued bleedings, for which no apparent cause can be found.

At the menopause age, and also much earlier, hemorrhages may occur without decided changes in the endometrium, and without the presence of new-growths. The bleedings are frequently controlled with difficulty and recur.

This form of decided hemorrhage is due to fibrosis uteri, to degeneration of the myometrium, or to local uterine atrophic changes caused by a cessation of trophic function on the part of the ovary and its secretion. Even though the only symptom is profuse hemorrhage, since the same changes are found in the

uterus in unexplainable bleedings in younger women, many of these latter cases must be viewed as due to the same causes. Among the pathologic changes which are responsible for these bleedings, in addition to fibrosis uteri and myometrial degeneration is uterine arteriosclerosis.

Trophic Changes in the Uterine Muscle.—Halban found that castrated newly born guinea-pigs showed no future development of the genitalia, and no development of the uterine muscle. Knauer found, after castrating rabbits, that the uterus atrophied and that the intermuscular connective tissue was increased. Sokoloff castrated dogs and found that the uterus, especially the circular layer, became atrophied, the vessels were thickened, and their lumen became smaller. Jentzer and Beuttner, on castrating cows, found an atrophy of the muscle and of the glands of the uterus, and increased growth of the connective tissue and changes in the stratum vasculare.

After castration the uterus atrophies. Benkisser found that the vessels of a uterus, removed three months after castration, showed a sclerosis and an endarteritis obliterans. Eckhardt found, one year after castration, that the uterus of a woman was atrophied, the endometrium likewise, and that the connective tissue was increased. Gottschalk found, one and one-half years after castration, that, although the muscle of the uterus was well preserved, the mucosa was atrophied and that the large vessels showed a folding of the intima. Therefore, after castration, the changes are like those occurring at the menopause. At and after the menopause the uterus undergoes regressive changes, the portio shrinks, and there results the so-called senile uterus. The wall is thin and anemic and contains much connective tissue; the vessels are thickened, narrow, and calcified. The mucous membrane is thin, flattened, and indurated.

This change occurs likewise in younger women, and is due to an early diminution of trophic and nutritional function on the part of the ovary, or to uterine atony dependent on constitutional causes. Why this early change in the ovaries should occur in certain cases is not known, for in our discussion we exclude those conditions resulting from acute infectious diseases

or periuterine inflammation. Such atonic changes in the uterine muscle at the climacterium, and increased changes of this kind in earlier periods, explain in part the irregular and profuse hemorrhages in some patients and the uncontrollable hemorrhages in others.

Elastic Fibers of the Uterus.—The elastic fibers of the uterus run between the muscle bundles, and upon the surface of the bundles; they may surround a fasciculus or they may perforate it. In the stratum vasculare, where the elastic fibers come from the adventitia, finer fibers are found in the interfascicular connective tissue, but most of these are not connected with the main fibers. They are sometimes absent in the virgin uterus. Elastic and fibrous tissue, situated between the muscle bundles, sends branches between and around every muscle cell, but always at right angles to the long axis of the cell. The individual muscle cells of the stratum subserosum have therefore a perimysium elasticum and a perimysium fibrosum; the muscle cells of the stratum supravasculare and the stratum vasculare have a perimysium fibrosum and often a perimysium elasticum. The fibers of the stratum submucosum have only a perimysium fibrosum.

The important muscle fasciculi are furnished with a framework or elastic support which protects the fibers from overstretching and permits their return to normal position on contraction. This elastic framework is especially well developed in the outer layer and permits any change of form on the part of the fibers. This arrangement whereby the main amount of elastic tissues placed in the outer two layers of the uterus has the advantage that it does not interfere with the contraction of the vessels; besides, any two points in the periphery are further separated, on dilatation of the uterus, than two points nearer the center, so that this supply is adapted to subsequent demands. The arrangement whereby the elastic fibers are arranged at right angles to the muscle fibers prevents any interference with contraction of the muscle and the vessels. The above-mentioned is the natural condition found between birth and the climacterium, namely, elastic fibers in the interstices of the muscle bundles and the muscle fibers (Pick).

Changes in the Elastic Fibers.—In the first half of pregnancy, so long as the myometrium grows, the elastic fibers undergo hyperplasia. The same is true of the parauterine and periuterine elastic fibers. In the second half there is diminution, probably relative, through stretching; possibly, however, there is an absolute diminution. This seems to be irrational, in view of the future stretching to which the lower uterine segment is to be subjected during labor; but in pregnancy there is a huge increase in the elastic structures situated at the sides of the uterus and around the lower uterine segment, so that on subsequent dilatation there is no interference with the muscle fibers of the uterine wall. This vicarious growth of powerful parametrial and perimetrial elastic fibers, the course of the uterine fibers at right angles to the line of contraction of the muscle bundles, the network of elastic and fibrous perimysium about the individual fibers, the equal distribution and course of the fine elastic fibers in the external wall of the uterus, are ideal conditions; yet this typical arrangement is somewhat lost in pregnancy, and the vessels of the stratum vasculare show proliferation, and so do the elastic fibers of the intima.

During the puerperium, however, there is a decidedly increased formation of elastic fibers, and after labor their increase is permanent, concomitant with a hypertrophy of the muscle fibers and a thickening of the vessels.

The typical arrangement of the elastic fibers is lost in pregnancy, at the climacterium, and likewise on the presence of myomata and in chronic metritis. The fibers are thickened and increased in number, and the typical arrangement is heightened in chronic inflammations, in the first half of pregnancy, and at the puerperium. The fibers are swollen through serous infiltration in pregnancy, in the puerperium, and in metritis exudativa. The fibers are degenerated in pus infiltrations. The fibers increase in thickness up to the age of fifty. After fifty they lose their continuity and become brittle and irregular. In old age they form lumpy groups in which the individual elastic fibers can be scarcely recognized, and form groups around the arteriosclerotic vessels which are likewise grouped together. The elastic fibers disappear from the

interfascicular connective-tissue interstices so that the circumvascular islands of elastic fibers lose all connection with each other.

In the senile uterus the elastic fibers of the corpus and cervix are increased. A similar condition is found in castration atrophy, and in addition the walls of the vessels are thickened and the elastic fibers in the adventitia are increased in amount. In older uteri there is then an increased number of elastic fibers. This is not alone a local condition, but is part of a general increase, such as takes place in the kidney, liver, heart, spleen, etc., and is an attempt at compensation for the disturbed mechanical relations due to the loss of epithelial and muscular tissue. It is true then that the greater the atrophy, the larger is the number of elastic elements, and that an increase of elastic elements is present in all atrophies of the uterus, whether natural, artificial, or as a result of disease. The elastic fibers in the arteriosclerotic vessel walls of the stratum vasculare are increased and, passing out into the myometrium, they take the place of the muscle bundles, which is of itself a proof that the adventitia is a source for their formation.

There is, therefore, a hyperplasia of the connective tissue coëxisting with a gradual degeneration of the muscle fibers at climacterium and in climacterium præcox, so that a framework is formed in the uterine wall, in the meshes of which lie the degenerating muscle cells, accompanied by an increase of the fibrous perimysium, especially in the external layers. The elastic elements are thickened and lumped, likewise in the pericellular and interfascicular spaces. The stratum submucosum has naturally few elastic fibers, and there is a lack of elasticity of the blood-vessels. Therefore, among the uterine alterations, there may occur a diminution of the muscle-elements, an increased amount of fibrous connective tissue, an increased amount of elastic connective tissue, an increased amount of elastic elements of poor quality. Even if the latter are not increased in amount they are thickened, brittle, and form polyp-like groups. The greater the hyaline and sclerotic changes in the vessel-walls, the greater is the amount of the elastic elements.

Arteriosclerosis.—Pichevin and Petit curetted a forty-one-year-old multipara for continued uterine bleedings, with no improvement. While performing a second curettage the bleeding from the uterus was so profuse that it was necessary to extirpate it. *Examination showed an increase in the number of vessels, which showed very much thickened walls, especially in the middle layer of the uterus. The muscularis was found almost supplanted by vessels.*

Marchesi reported a case of a thirty-two-year-old multipara who had aborted several times. For very profuse bleedings abrasio was done, but the bleedings increased and a hysterectomy was performed. The uterus was found to be increased in size and its walls were filled with the gaping lumina of blood and lymph-vessels. Toward the mucosa the blood-vessels were increased, so that at this part the uterine structure had the appearance of cavernous tissue. The adventitia of the arteries showed an increase of connective tissue, the intima was thickened and uneven. Marchesi observed the occurrence of bleedings which were not controlled by abrasio, and where the endometrium showed no great changes. The pathologic condition is therefore a change in the vessels themselves. He quoted from the French literature six recent cases of this character showing no affection of the glands, of the interstitial tissue, or of the uterine parenchyma, but *decided changes in the vessels of the mucous membrane and the muscularis.*

Reinicke reported four cases, two of which suffered from uterine bleedings, which could not be controlled; the other two, in addition, showed, on examination of the scrapings, suspicious areas. In these cases ergot and ergotin were of no value, dilatation of the cervix and the application of liquor ferri brought only temporary relief, and extirpation was necessary. Examination showed that with *degeneration of the muscularis, the arteries had become stiff tubes.* All four cases showed a thickened media of the vessels and a growth of perivascular and intermuscular connective tissue. This condition is viewed as an arteriosclerosis.

Cholmogoroff reports two cases where the severity of the bleedings endangered life. No new growths or decided changes

of the endometrium were present, and curetting brought no relief. The first case, a forty-two-year-old XI-para, had aborted six times. Her menstruation had become gradually stronger, returning every three weeks, and lasting for eight days, with a profuse loss of much blood and coagula. In the intervals fluor albus was present. Hydrastis and ergotin being of no avail, an abrasio was performed and showed no abnormal condition of the endometrium. After an uncontrollable hemorrhage the uterus was extirpated. On section, the vessels of the uterine wall gaped. The mucosa was normal, but the small vessels showed the intima to be thickened in spots, and almost obliterated. The muscularis showed an apparent increase in the number of vessels, but this was possibly an illusion due to their twisted course. *All the vessel walls were thickened, with a diminution of the lumen. The connective tissue was increased.*

The second case was a patient, twenty-one years old, who had aborted twice. Her menstruation lasted eight to ten days, and was very profuse, recurring every three and later every two weeks. Leukorrhea was also present. An abrasio showed a normal mucous membrane with hemorrhagic areas. The bleedings recurred so often and were so profuse that a hysterectomy was performed. The muscularis was firm and grated on incision. The vessels looked like pale strips on the cut surface and their lumina gaped. *The connective tissue was increased. There was a thickening of the arterial walls in the muscularis*, especially of the media and the intima. There was an increase in the connective tissue, especially that seeming to come from the adventitia of the vessels.

Arteriosclerosis is relatively frequent in women in the preclimacteric age. There seems to be a connection with frequent pregnancies, especially if these follow each other closely; in other cases there is a myomatosis or fibrosis uteri. We know from experience after castration that, on cessation of the ovarian secretion, there is an alteration in the thyroid and certain symptoms of hypersecretion of the hypophysis, just as after removal of the thyroid. The cessation or hypofunction of thyroid and ovary stimulates the adrenals, an effect which is supported through the hyperfunction of the

hypophysis (Jaschke). It is a question whether there is a connection between the changes in the secretion of various internal glands on the one side and the preclimacteric and climacteric arteriosclerosis on the other. The vessels of the genitalia, and especially of the uterus, often show arteriosclerosis. Only in half the cases are signs of arteriosclerosis found in the other parts of the body. This arteriosclerosis of the uterine vessels may cause profuse bleedings. There may, however, be no change in the muscles or vessels to account for metrorrhagia. There may be no changes in the mucous membrane, but there may be hypersecretion of the ovaries.

DIAGNOSIS OF MYOMETRIAL DEGENERATION, FIBROSIS, AND ARTERIOSCLEROSIS

From the foregoing, it is possible to conceive a very clear picture of the pathologic changes and of the several distinct factors which make a diagnosis positive. When menstruation becomes severe, menorrhagia or metrorrhagia occurs, and no local changes in the endometrium can be observed with a sound or with the examining finger or in microscopic sections, it is logical to presume that one or all of the following conditions are present: (1) Degenerating muscle fibers poor in contractile power; (2) an increased amount of fibrous connective tissue; (3) an increased amount of elastic fibers, thickened and brittle; (4) arteriosclerotic vessels. Age is no criterion, since these changes may occur long before the natural climacteric period. If ergot, thymus and mammary extracts, stypticin, etc., are of no avail; if no decided changes in the adnexa, sufficient to warrant their being considered the cause of the hemorrhage be present, if curettings show no altered condition of the endometrium; and if, above all, curetting does not control the hemorrhage, then the diagnosis of muscular degeneration, fibrosis uteri, or arteriosclerosis must be made. It is scarcely necessary to mention that myomata, sarcomata, carcinomata, and other local conditions are to be excluded on examination. These cases of fibrotic uterus are usually found in well built, strong women who withstand even profuse bleedings well. Their

ovaries are functionating too much and are producing congestions which the fibrotic uterus cannot control by ordinary contraction of the muscle, elastic fibers and vessels.

TREATMENT

The treatment of these cases may consist of: (1) Drugs, such as ergot, pituitrin, stypticin, etc.; (2) constitutional treatment; (3) organotherapy; (4) curettage; (5) x-ray; (6) radium, and (7) hysterectomy.

Aside from drugs, *uterine and pelvic anemia* can be promoted by appropriate douches, sitz-baths, applications to the lower vertebræ, abdominal applications, by the intrauterine application of the positive electrode, by intravaginal pressure-therapy, and by cardiac tonics.

Since thymus extract is antagonistic to ovarian hyperactivity, and mammary extract exerts a restraining influence on uterine bleeding, they may well be combined to advantage:

℞ Ext. Mammary Desicc.....gr. v.
Ext. Thymus Desicc.....gr. v.
M. —Ft. tal. capsul. No. XL.
S. —One before meals.

Pituitary anterior gr. v, placental extract gr. v may be combined in capsules and given t. i. d.

Curettage, followed by intrauterine packing with iodoform gauze, and the administration of 15 drops of ergotole several times a day, will sometimes diminish the size of a fibrotic uterus. While the curettage serves as a method of treatment, and helps to control the bleeding, it is of more importance as a diagnostic procedure. The scrapings should always be examined microscopically, so that an early carcinoma of the fundus may not be overlooked.

X-ray or radium therapy promptly checks the bleeding from a fibrotic uterus. They also stop climacteric bleeding immediately, but should be preceded by a diagnostic curettage.

Of all gynecologic conditions, menorrhagia, at or during the menopause, is the most responsive to radium applications. Sixty milligrams of radium, inserted into the uterine cavity

for twenty-four hours, is followed by complete cessation of the bleeding.

If internal medication, constitutional treatment, and organotherapy fail to control the bleeding, and radiotherapy is not available, vaginal or abdominal hysterectomy is indicated. The risk of the operation is slight, and it affords an opportunity to deal with other pelvic lesions at the same time. If there be no polypoid changes in the endometrium, if there be no submucous fibroid, if there be no malignancy, experience has shown that patience in the use of endocrine and other preparations will often effect a cure. Eygotin, Stypticin, Corpus Luteum, Placental extract, Pituitary anterior, Mammary extract, Thymus extract in various combinations are well worthy of patient trial.

CARCINOMA

CARCINOMA VULVÆ

Psoriasis Vulvæ, or Leukoplakia.—This disease is characterized by circumscribed, white, slightly elevated areas on the inner surface of the large and small labia. Carcinoma often develops from these just as it follows like lesions on the tongue. So soon as the surface becomes papillary and infiltration occurs around the base, it is probably malignant. Carcinoma may also develop from the vulvar condition known as vulvitis pruriginosa.

Carcinoma of the vulva may begin in the glands situated around the external meatus of the urethra, in the prepuce or small labia. It is most frequent about the prepuce and is more frequent than carcinoma of the vagina. It looks like carcinoma of the skin anywhere, beginning as a small, hard node which breaks down. Ulcers result which are elevated above the skin. There is infiltration about the ulcers. Then the ulcers grow deeper and the inguinal glands become involved.

Carcinoma vulvæ occurs in two forms, known as (1) cancroid, (2) infiltrating carcinoma.

Cancroid is a new squamous epithelium growth projecting above the surface. Degeneration occurs late, with the formation of a flat, slowly deepening ulceration with hard edges and infiltrated base. It is generally situated on the inner surface of the large and small labia and about the clitoris.

Infiltrating carcinoma is a large hard tumor, with deep extensive infiltration and degeneration, resulting in an ulcer with irregularly infiltrated edges and with a greasy base. Before ulceration a diagnosis is difficult. Superficial or deep infiltration, plus degeneration, makes the diagnosis. There are then warty, irregular, productive growths which are hard, especially about the base (Winter).

The conditions from which these affections may have to be differentiated are the following:

Pointed Condylomata.—They are pedicled growths covered with squamous epithelium and a lobulated surface, and in some cases may be as large as a cherry, with a thin pedicle and lobulated surface. The papillary bodies of the skin have grown above the surface and are covered with thickened squamous epithelium. There is also connective-tissue papillary overgrowth, likewise covered by squamous epithelium. The process is superficial. There is no penetration of epithelial strands into the tissue, nor are there independent extensions of epithelial elements. Pointed condylomata of the vulva may be present on the large labia, especially on the inner side, or on the anterior or posterior commissure or on the perineum, or about the anus, and are generally the result of a neglected gonorrhea. They may form groups of growths of the above character, especially in pregnancy. They have then a cauliflower look and may show surface degeneration. The base is soft and degeneration is not deep. There are isolated papillomata in the periphery. They are to be diagnosed from carcinoma, but carcinoma of this size is eroded, bleeds easily, and degenerates.

Pointed condylomata are very often found in connection with gonorrhea, but not rarely, according to Joseph, after a chancroid. These, then, are contagious and produce after cohabitation the same form of excrescences on the infected person. Pointed condylomata may also occur with non-venereal conditions such as purulent or irritative vaginitis or vulvitis.

Chancre is a red, round ulcer. Its surface is smooth and produces a serous exudation. It is sometimes very small and is often overlooked. Large chancres evidence greater induration and have elevated edges. Early benign glandular involvement takes place in the inguinal region, followed gradually by an involvement of all the glands of the body.

Broad Condylomata.—Mucous patches, or condylomata lata, are round, flat, gray elevations without pedicles. The epidermis on the surface is often softened, and sometimes through the loss of epidermis may leave a raw area, especially at the center, as a result of which serum exudes. Older patches

become rough and more warty. They are generally multiple and are usually situated on the small labia. Both sides are generally symmetrically involved by contact inoculation.

Chancroid is an ulcer with undermined elevated edges and no infiltration of the base. It occurs from inoculation by another chancroid. It is often accompanied by virulent bubo, *i. e.*, inflammatory involvement of related lymphatic glands. There are often contact chancroids, *i. e.*, inoculation by a chancroid of a surface in contact with it. Chancroid may occur on any part of the vulva, and may readily infect the hair-follicles. It has a tendency to heal from the periphery toward the center. It is generally found in puellæ publicæ.

Tubercular ulcers of the vulva are ulcers situated on the small labia and the frenulum and are covered by grayish membranes. They are of irregular form. The base is composed of cheesy tubercles and gray nodules. Tubercle bacilli can be found.

Ulcus Rodens Vulvæ.—On the posterior commissure, near the hymen, in the fossa navicularis, and extending into the perineal body is an ulceration with sharply outlined edges. The hymen is swollen and does not pit on pressure. Deep fistulas result which may extend even into the rectum. The rectum is ulcerated. The anus is surrounded by edematous blue or white hemorrhoids. The large labia are swollen, tense, and do not pit. If this ulceration extends higher, the urethra finally becomes destroyed and is surrounded by scars. There is edema and ulceration everywhere. The whole is characterized by a destructive hypertrophic ulceration. This condition is called by some lupus, by others elephantiasis, and by others ulcus rodens. Giant cells have been found, and are considered by some as evidence only of a secondary tubercular involvement. Ulcus rodens is generally found in puellæ publicæ, and usually in those with a syphilitic history. It is not affected, however, by mercury or iodids, which possibly indicates that syphilitic individuals are very susceptible to this condition, whatever its nature may be. Veit considers that a close relation exists between ulcus rodens, so-called elephantiasis, and so-called tuberculosis. It may be stated

that stricture of the rectum is proof, in a differential diagnosis, of the syphilitic nature of a lesion of this character.

Tertiary lues is evidenced by flat ulcerations of productive nature. The large and small labia and perineum are diffusely thickened, with resulting non-pitting edema or elephantiasis. The whole has a bronze color and there is ulceration about the external meatus. The small labia may be perforated. There is deep infiltration. Characteristic is the flat ulceration with chronic edema. The rectum is often stenosed. In other cases the vulva looks red, rough, and eroded without deep ulceration. The lesions are especially marked around the urethra, perineum, and anus. There are pink rough growths, covered with skin, or deep defects or edema of the vulva. Sometimes the outer end of the urethra seems lost in the nodular eaten-out area, due to degeneration of the infiltrated tissues. It is to be distinguished from tuberculosis or lupus. Tuberculosis of the vulva resembles tertiary syphilis. The diagnosis is made by the finding of the tubercle bacilli. Stricture of the anus is frequently observed in syphilis.

CARCINOMA VAGINÆ

Carcinoma of the vagina generally takes the form of flat infiltrations which affect part or all of the vaginal mucosa, especially the posterior wall. There is early ulceration of the surface. Occasionally vaginal carcinoma takes the form of large tumors of broad extent filling the lumen of the vagina which ulcerate. It occasionally takes the form of irregular, papillary, bleeding projections lying on the surface and affecting the whole vagina without deep infiltration. The first form may extend under the mucosa gradually and involve the whole length of the vagina, almost occluding the lumen. It involves the bladder and rectum. Carcinoma of the vagina is characterized by superficial infiltration in the form of nodules or flat tumors. Ulceration makes the diagnosis certain.

Sarcoma of the vagina causes flat ulcerating infiltrations or rounded tumors covered by mucosa. Sometimes there are grape-like bodies, also found in children. Otherwise it cannot be diagnosed clinically from carcinoma.

CARCINOMA OF THE PORTIO

Carcinoma of the portio, or vaginal portion of the cervix, either grows out and projects into the vagina or grows inward and infiltrates the portio (Winter). It originates from the squamous covering.

I. *The polypoid or cauliflower form* either has a broad base or is pedicled with a base the thickness of a finger or more, and is of the size of a hazelnut up to that of a fist. The surface is irregular, rough, brittle, and generally covered with gangrenous masses. If it degenerates slowly, it is characterized by infiltration. If it degenerates rapidly, it is characterized by ulceration. Cauliflower carcinoma of the portio is easily

Fig. 138.—Cauliflower carcinoma of the portio vaginalis of the uterus (in longitudinal section) (Winter).

diagnosed by the finger and inspection. It presents a growth in polypoid form on the outer side of the portio. Its surface degenerates and is rough and brittle. A probe penetrates it easily. Portio carcinoma may be flat on its surface. Every growth above the surface, especially if at first very hard, is ominous (Fig. 138).

II. In the *infiltrating form* there is thickening and hardening of the portio. The infiltration extends to various depths of the cervix, rarely above the fornices. The surface shows little loss of substance. Sometimes the surface is intact. It is then a carcinoma in the substance of the portio and therefore an infiltrating carcinoma. The cervix is cartilaginous, broad, plump, and irregular. The diagnosis, in the

presence of a hard and smooth surface of the cervix, is difficult. The diagnosis is easy when the cervix ulcerates and degenerates (Fig. 139).

III. *Carcinomatous cavity.* There is a funnel-shaped hole in the cervix resulting from tissue destruction and generally situated in one lip. This runs parallel to the cervical canal or extends into it (Fig. 140).

IV. *Carcinomatous ulcer or ulcus rodens* is a flat ulceration on the cervix without extension into the depth of the cervix, but

Fig. 139.—Infiltrating carcinoma of the portio. The carcinoma infiltrates one lip and the neighboring fornix, but is still covered by intact squamous mucosa (Winter).

Fig. 140.—Carcinomatous cavity in the portio (Winter).

with a tendency to extend superficially, generally on one lip. It spreads to the fornices and vagina, rarely into the cervical canal (Fig. 141).

Ulcerative carcinoma on the portio is recognized if a depression is formed, with uneven, rough, degenerated wall, and hard surrounding tissue. If the depression is only slight, the degeneration may be recognized on inspection. The polypoid form and ulcus rodens have a greater tendency to spread to the vagina, and do so, superficially. The others spread into the vagina through the submucous tissue and represent infiltrations in the vagina covered by mucosa, which infiltrations may extend down to the introitus. The infiltrating form and the

carcinomatous cavity rarely extend above the internal os. They involve the connective tissue, that is, the parametrium, generally posteriorly and laterally. Bladder and rectum are seldom attacked.

Carcinoma of the portio takes its origin from the squamous epithelium or from erosions.

Carcinoma of the portio occurs in different forms, according as it takes its origin from the squamous epithelium or from erosions. The form which comes from the squamous epithelium is sometimes called *cancroid*. That which originates in erosions

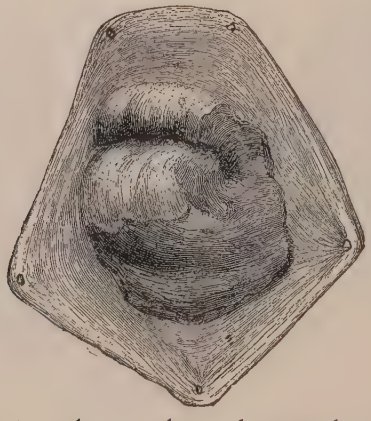


Fig. 141.—Carcinomatous ulcer, or ulcus rodens, on the posterior lip and the neighboring fornix (Winter).

may be squamous in character, due to a metaplasia of the cylindrical epithelium, or there may be no metaplasia.

Clinically, carcinomata of the portio are either ulcers or cauliflower tumors.

Carcinomatous ulcers of the portio have a hard infiltrated periphery with a greasy base. In the early stages they may be mistaken for chancre. These ulcers may occur on one or both lips of the cervix or around the external os. They may have penetrated deeply, leaving the surface relatively intact and forming round nodes in the tissue. When these break down, the surface is destroyed and little cavities occur in the portio.

In a differential diagnosis the following conditions must be considered:

Pointed Condylomata of the Cervix.—In pregnancy they may be very close together and may form a circumscribed tumor on the external surface of the cervix and give the portio an irregular papillary surface. The base is not infiltrated, there is no real ulcer, they look whitish-red, and others may be found in the vagina and on the vulva.

Ulcus simplex hemorrhagicum is not large, is sharply outlined but not very deep. There is small-celled infiltration with dilated vessels. There is no epithelium on its surface and very few glands, if any. The cause is not known.

Erosions are situated around the external os; have a very red color and a shiny surface, and no sharp outlines; there are often follicles on the cervix. There is cervical catarrh. If clean, they are easily distinguished from carcinoma, with the possible exception of that form known as erosio-papillaris with rough surface. If the surface becomes infected and covered with a membrane, it is often hard to diagnose from a carcinoma except by microscopic examination of an excised section.

Erosion ulcers are different from erosions and are distinguished by the microscope as follows: Erosion glands with cervical cylindrical epithelium in them lie in small-celled infiltrated tissue which is rich in vessels. The tissue of the portio is deeply infiltrated by glands. Through local treatment, injections, etc., there results a loss of substance. There is diffuse infiltration and a development of the large vessels.

Decubitus Ulcer.—When due to the presence of a pessary, it is situated directly on the spot where the pessary presses. It has a sharp border and ulcerative base. The base, however, is not infiltrated and heals easily. It is generally not situated immediately about the external os. It is also frequently present with prolapse of the uterus and then shows a large loss of substance on the cervix, extending into the vagina.

Chancre in the early stages is hard to differentiate except by a dark-field examination, and the detection of the spirocheta pallida in a scraping from its surface. Later on it is a flat ulcer with an infiltrated cartilaginous base, sharply outlined and covered by adherent yellowish-gray membrane, and

may be single or multiple. Concomitant inguinal adenitis is almost pathognomonic. Constitutional symptoms result.

Mucous patches are white or yellow, and elevated, with degenerated surface. They are also present in the vagina and vulva, where they are not ulcerated.

Gummatous ulceration is situated near the external os, often affecting both lips, and is sharply outlined. There is a yellow covering over bleeding granulations. Gummatous ulceration breaks down slowly. There is a crater-like deepening and peripheral extension with serpiginous outline.

Ulcus Molle.—Soft chancre is a rapidly spreading ulcer with punched-out, elevated, undermined edges. The base is not infiltrated. Membranous spots are on its surface. Such ulcers are often multiple. Contact ulcers are present and other ulcers in the vagina and on the external genitalia are noted.

Tuberculous Ulcer.—Ulcer with undermined edges, partly sclerosed. Situated about the external os. Yellow irregular base which is not infiltrated. Microscope shows small-celled infiltration area with degeneration and detritus. By microscope many giant cells are found. Finding tubercle bacilli makes the diagnosis.

Ulcerative Carcinoma of the Portio.—If superficial, it is hard to diagnose. It has a yellowish-gray surface which is irregular and papillary. The base is infiltrated and the character of the ulceration conveys the impression of loss of substance. If deep, there is seen an ulcer with an uneven, rough, destroyed base. There is infiltration about it. Evidences of degeneration and destruction are present. It can be easily penetrated by the sound or finger. One can easily tear off the fragile tissue with the finger. Such brittleness of tissue is always suggestive of carcinoma.

CARCINOMA OF THE CERVIX

A carcinoma which starts from the lining of the cervix may, like some cases of carcinoma which begin from erosions, show a change of the cylindrical epithelium to squamous epithelium, with solid cell groups invading the cervical wall. On the other hand, the glands of the cervix generally produce a growth of

cylindric epithelium resulting in an adenomatous carcinoma. Clinically, cervix carcinoma is often a polypoid tumor starting from a benign mucous polyp. In other cases the wall of the cervix is diffusely infiltrated, and when degeneration occurs a large cavity is present.

Infiltrating Carcinoma.—There is an infiltration in the cervix caused by a thickening of the wall and slight tendency to ulceration. It is simply a large nodule covered with intact mucosa till the latter becomes thinned out and infected. The mucosa

Fig. 142.—Infitrating carcinoma of the cervix (Winter).

Fig. 143.—Carcinomatous cavity in the cervix, occurring through degeneration of an infiltrating carcinoma (Winter).

sometimes remains intact for a long time, and the diagnosis is difficult. The cervix is infiltrated but still covered with mucosa. The cervix is enlarged, thick and plump, hard as cartilage, but often elastic. As the carcinoma approaches the external os, yellow points of degeneration may be visible, and the superficial areas are easily rubbed off. When the carcinoma extends still further, it breaks down and looks like a primary portio carcinoma. It is easy to overlook this growth if it is in the cervical canal and above the external os. It is to be diagnosed from metritis colli and follicular hypertrophy, from interstitial myoma, and from chronic cervical catarrh of older women. The curet and microscopic examination of the scrapings aid in the diagnosis (Fig. 142).

Metritis colli with lacerations may resemble an infiltrating carcinoma, but the whole cervix is usually involved. There is a surface of smooth mucosa. The resemblance to carcinoma is marked if the portio is filled with dilated follicles.

Follicular Hypertrophy of the Cervix.—There is a smooth covering of the portio, through which dilated follicles are observed. The surface is not rough or papillary, and its consistence is not brittle. Follicular hypertrophy of the cervix is distinguished from carcinoma by the presence of dilated erosion glands. Under the microscope the epithelium in the follicles of Naboth is of a single layer and cubical.

Fig. 144.—Ulcerating carcinoma, with destruction of almost the entire cervical canal (Winter).

Carcinomatous Cavity.—This follows degeneration of the infiltrating carcinoma (Fig. 143).

Ulcerative carcinoma involves the cervical canal superficially. It does not grow deep, but it degenerates quickly, therefore a large space is formed with a thin wall which is not infiltrated (Fig. 144).

Those carcinomata in the cervical canal which by ulceration have opened out upon the external surface of the portio are diagnosed by the rough, raw, brittle walls of the cavity, especially if there is infiltration of the surrounding tissue. If the finger can enter the cervical canal, it feels the irregular thickness and the rough surface with a fragile, brittle consistency. If the curet is used in the cervix and very gently applied, much tissue can be removed, and the diagnosis of carcinoma is then beyond doubt. These forms may extend into the vagina, but may also involve the vagina under the mucosa by infiltration. *They quickly involve the parametrium.* The bladder is involved early, the rectum late.

CARCINOMA OF THE FUNDUS

Carcinoma of the fundus starts from the mucous membrane and includes the so-called adenomatous carcinoma, formerly

often called *adenoma malignum*. This is now regarded as genuine carcinoma. Carcinoma of the corpus may begin from a mucous polyp. Uterine carcinoma may be circumscribed, or it may be diffuse.

I. **The Diffuse Form.**—Carcinoma of the fundus begins in the uterine mucosa. The diffuse form affects the whole mucosa and produces irregular thickenings and villous outgrowths, with infiltration of the wall and thickening of the whole uterus. It finally penetrates the entire wall (Fig. 145).

Fig. 145.—Diffuse carcinoma of the fundus uteri (Winter).

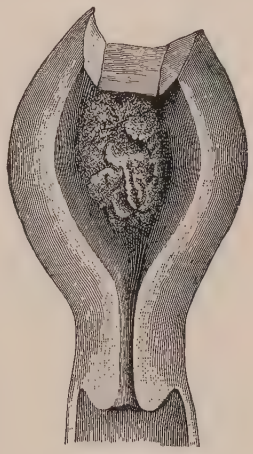


Fig. 146.—Circumscribed carcinoma of the fundus uteri (Winter).

II. **The Circumscribed Form.**—Like I, only circumscribed (Fig. 146).

III. **The Polypoid Form.**—The polypoid, thin-pedicled form is rare. There is a polyp filling the uterine cavity which is soft, brittle, and degenerating. It may grow externally into the wall or internally into the uterine cavity.

The only parametrial tissue which becomes involved is the ligamentum latum. The peritoneum is invaded by direct extension of the carcinoma through the uterine wall. Metastases into the ovaries occur.

CHARACTERISTICS OF CERVICO-UTERINE CARCINOMA

Carcinoma of the uterus has a tendency to superficial degeneration. This surface is an excellent medium for the

growth of micro-organisms, which include not only saprophytes but also streptococci and other pathogenic organisms. These superimposed infections explain the fever sometimes occurring with carcinoma. The carcinomatous process results in erosion of the blood-vessels and accounts for the characteristic bleeding which occurs on coitus, on examination, or independently.

Carcinoma is disseminated in four ways: by continuity of tissue, through the lymphatics, by the blood stream, and by implantation.

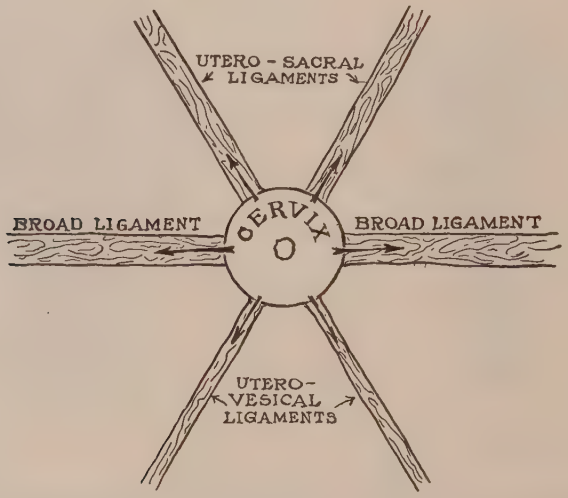


Fig. 147.—The parametrium. The cervix is surrounded by and embedded in a large amount of cellular connective tissue, which spreads out in the form of a six-pointed star. Each arm is covered by peritoneum, and contains muscle fibers, blood-vessels, and lymphatics. This diagram illustrates the reason for early extension of inflammatory and malignant involvements of the cervix into the parametrium.

Carcinoma of the cervix or of the corpus may extend upward or downward and by direct continuity involve the entire uterus. In addition, cervix carcinoma may produce metastases in the fundus, and a fundal carcinoma may cause metastases in the cervix. Frequently there occur implantation metastases in the vagina through direct implantation of cast-off cells or through retrograde lymphatic extension. Carcinoma rapidly grows through the uterine wall, especially carcinoma of the cervix, and soon invades the connective-tissue parametrium. This exten-

sion may involve the ureters, or the bladder, or the recto-uterine space, or the general peritoneum. In the end-stage of a uterine carcinoma there is a complete filling of the small pelvis with a firm mass, in which the various organs cannot be identified, resulting in compression of the rectum and ureters and the formation of fistulas. Often before the malignant process reaches the surrounding tissues by direct continuity, there are lymphogenous metastases into distant structures. Involvement of the lymph-glands of the pelvis may occur in the very early stages (Winter).

1. Carcinoma of the portio involves the hypogastric lymph-glands, situated between the external iliac and the hypogastric arteries. A few lymph-glands in the ligamentum latum, situated where the uterine artery and the ureter cross, and the internal inguinal glands are often involved early.

2. Carcinoma of the cervix. In addition to the hypogastric and internal inguinal glands, the internal sacral glands between the hypogastric artery and the rectum, as well as the external iliac glands situated external to the external iliac artery, are involved.

3. Carcinoma of the fundus involves the external iliac glands and the inferior lumbar glands situated on the common iliac artery, and the superior lumbar glands situated near the lower end of the aorta. In advanced cases all these glands and other glands up to the diaphragm may be affected and metastases may occur in any of the organs of the body. Lymph-nodes are often swollen without their being infiltrated by carcinoma. This inflammatory involvement of the glands may be caused by the numerous micro-organisms present in the carcinoma.

Most malignant is carcinoma of the cervix, because it spreads rapidly through the uterus and involves the lymph-channels and parametrium. Carcinoma of the portio is almost as dangerous. The prognosis is better in carcinoma of the corpus, because involvement of the lymph-channels and broad ligaments occurs late.

The majority of cases of carcinoma occur in women who have borne children. Hofmeier found only 5 per cent., out of eight

hundred and twelve cases, in women who had not borne children. The average number of labors was eight.

SYMPTOMS OF CARCINOMA OF THE PORTIO, CERVIX, AND UTERUS

Primary carcinoma occurs more frequently in the uterus than any other organ in the body. In the beginning, cancer of the uterus is essentially a local process, and the diagnosis is of greatest importance before the symptoms are so marked that it is easy.

Two symptoms suggestive of portio carcinoma are bleeding on cohabitation and post-climacteric hemorrhage. Bleeding coming on several months after menopause is particularly significant. Other symptoms are irregular metrorrhagia, and discharge, either foul, bloody, and mixed with tissue particles, or sero-sanguineous, like meat-juice. The diagnosis depends on the evidence of new-growth and infiltration plus degeneration.

Myomata, polyps, uterine fibrosis, and endometritis must be excluded.

The symptoms of carcinoma of the cervix are not pathognomonic in the early stages. In older women menstruation has generally ceased and then recurs. In other cases menstruation does not cease, but becomes more profuse. Often the first symptom is bleeding on coitus. The loss of blood at first may simulate menstruation, but is abundant. Then bleeding occurs irregularly on coitus, on the performance of any act involving effort, or with the straining at stool associated with constipation. There is usually a loss of mucus stained with blood. Ofttimes the only symptom is a slight leukorrhea, streaked with blood. Characteristic is the disagreeable odor and the thick, brown character of the blood. This is usually due to superficial degeneration of the carcinoma.

Every case of uterine disease, evidenced by infiltration, ulceration, or discharge, that resists appropriate treatment, should be viewed with suspicion.

Pain may be absent entirely until late in the disease. Sometimes it is present in the beginning. Some patients complain of backache, while others have peritoneal irritation. Then

comes cachexia, loss of weight and strength. If the bladder is infiltrated, there is frequency of urination and dysuria. If the rectum is involved, there is tenesmus and difficulty in passing feces. Hemorrhoidal bleeding and pain in the anus are noted. Patients often complain of sleeplessness and restlessness, and especially marked is the loss of appetite. Not infrequently sexual desire is increased. Most of these symptoms, and pressure symptoms, appear in the later stages of the disease, and are relatively unimportant. The diagnosis should be made before they occur.

In the very early stages the diagnosis can be made by microscopic examination. *But, when the specimens show malignant degeneration, the patient should be operated upon or receive x-ray or radium treatment before the next day.* It is of the greatest importance to make a test excision in every suspicious case, because the clinical symptoms resemble those of chronic metritis, of erosions of the cervix with hypertrophy of the cervix, and of ulcers of various forms. Winter finds the cystoscope of great importance in diagnosing infiltration of the precervical connective tissue. However, the projection of the trigone, swellings of the mucous membrane of the bladder, hemorrhage in the mucosa, œdema bullosum, changes in the openings of the ureters, and papillary excrescences all resemble closely the same changes occurring in precervical inflammation due to bacterial involvement.

In the case of ectropion, erosion, and ulceration, an application of 10 per cent. copper sulphate checks bleeding, or blanches the surface. If the suspicious surface is cancerous, however, the copper sulphate will cause bleeding. These applications may be repeated every three or four days, and any bleeding point that persists after the rest of the surface is healed, should be excised for microscopic examination.

Corpus carcinoma has been regarded as relatively infrequent, occurring in only 10 per cent. of cases of uterine carcinoma. As a matter of fact, however, it probably occurs more often, but is not recognized until the cervix is involved, by continuity of tissue. "Chronic endometritis with long-continued profuse menstruation" is the usual history. Corpus

carcinoma is characterized by its insidious development. It has been observed to have been confined to the body of the uterus for five years. The parametrium becomes involved late in the disease because the corpus has not the rich lymphatic communications of the cervix. Hence, the prognosis is better.

The symptoms of corpus carcinoma include: (1) A long continuation and a profuse character of menstruation. The recurrence of menstruation after a shorter or longer period of cessation is a symptom of great importance. (2) The discharge of watery fluid, later taking on the character of meat extract, and finally becoming purulent and foul-smelling. When degeneration occurs the discharge is extremely disagreeable. (3) Pain in the back and legs and severe pain in the abdomen. Almost pathognomonic when they do occur, are colicky pains occurring at certain hours of the day and subsequent foul bloody discharge containing tissue detritus. Not infrequently there occurs peritoneal pain through extension of the carcinoma under the serosa. The uterus is often enlarged. Carcinoma of the fundus occurs in the majority of cases beyond the climacterium. Irregular bleeding, sero-sanguineous flow, especially if fetid, and intermittent uterine colic are the symptoms. In the early stages the uterus is normal. Later the uterus is thicker, larger, harder and irregular. The repeated examination of scrapings is essential. The history of a return of menstruation plus the discharge and the pain, added to the size, hardness, and irregular feel of the uterus, distinguish a carcinoma from a myoma.

The diagnosis can be established by microscopic examination of the scrapings from the uterus, removed by the curet. Examination with the finger shows new-growth plus degeneration. There is a circumscribed or diffuse, hard, infiltrating, thickening, or else the infiltration of a carcinomatous ulcer is felt or else papillary growths or brittle tumors are noted.

If the carcinoma does not remain limited to the uterus, there is local extension to the vagina, parametrium, bladder, and rectum.

The neglect, on the part of patients, to consult physicians on the first appearance of bloody or sero-sanguineous discharge,

especially at the climacteric age or after menopause; the failure, on the part of physicians, to make a thorough bimanual and tactile examination, and to examine thoroughly with the aid of a speculum and the uterine sound; the failure to make test excisions and test curettings for the purpose of microscopic examination; the failure to consider all cases at this period and even much earlier as malignant unless another diagnosis can be positively made; all these are factors in depriving many women of an early diagnosis of cancer of the uterus, and the prompt application of those remedial measures which offer the only hope of cure. Cervical carcinoma, situated in an area surrounded by the six connective-tissue ligaments and by additional connective tissue, all rich in lymphatics (especially the broad ligaments), is an extremely malignant disease because of the readiness with which secondary extrusions of the malignant process invade the periuterine tissues. When these cervical carcinomata are seen before such invasion of the surrounding tissues and pelvic glands, the prognosis is better, more cases are cured, and recurrences are fewer. Carcinoma of the fundus invades the broad ligaments comparatively late because the amount of lymphatic connective tissue in the upper part of the broad ligament is slight. In the lower half of the broad ligament the lymphatic supply is abundant. Yet in this lower area of the uterus, in the cervix whose outer covering is visible and whose canal is so readily entered by the sound or curet, that is, in that part of the uterus which nature has selected for the location of the largest number and the most malignant of uterine carcinomata, the development of carcinoma is not looked for nor recognized with the frequency that is possible nor with the care and attention that constitute a duty. Carcinoma of the uterus has a mortality which can be reduced immeasurably, if these facts are accorded due consideration, and if the laity are made aware of the meaning of the premonitory symptoms of irregular bleeding and sero-sanguineous or disagreeable discharge, especially when either of these symptom occur at the menopause age or after the amenorrhea of the climacterium.

TREATMENT OF MALIGNANT DISEASE OF THE VULVA

If the disease has not invaded the deeper tissues, there being no involvement of bone or adjacent lymphatics, and the condition is still operable, prompt and wide excision is the treatment to employ. After the wound has healed, applications of radium or x-rays are made to prevent recurrences.

In the more advanced cases, with extensive malignant infiltration, a large part of the growth can be destroyed by electrocoagulation, using the Oudin current and a very fine brush spark. This is followed by a full erythema dose of either radium or x-rays, and if the x-rays are applied, six or seven millimeters of filter should be used. The adjacent lymphatic glands are subjected to the same radiation, and the full erythema dose is repeated in three or four weeks.

In the very advanced cases where the ulcerating surface becomes malodorous, equal parts of charcoal and iodoform may be dusted on the surface, after cleansing with permanganate, 1:3500. Sufficient morphin must be prescribed to keep the patient comfortable.

TREATMENT OF CARCINOMA OF THE PORTIO AND CERVIX

Before considering the various curative and palliative measures used in the treatment of cancer of the cervix, it is necessary to classify the cases as: (1) operable, (2) borderline, (3) inoperable, and (4) recurrences.

Operable.—This term refers to those cases in which a cure may be reasonably be expected after the employment of either the Wertheim (abdominal) or Schauta (vaginal) radical operations, or their various modifications. Both operations consist of complete hysterectomy with wide removal of the parametrial tissues. Their purpose is to remove not only all of the disease, but a large amount of uninvaded healthy tissue as well. The advisability of a radical operation does not depend upon the possibility of actually carrying out the technic, but upon the probability of the parametrial structures being free from carcinoma cells. Therefore, to be placed in this category, the malignant process must be limited to the cervix, the uterus must be freely movable, there must be no extension by con-

tinuity of tissue into the vagina, rectum, or bladder, and the parametrial structures and their contained lymphatics must be free from involvement. These requirements imply early diagnosis, and upon prompt recognition of the malignant process depends the patient's only hope of complete cure.

Borderline.—There are some cases which comply with the above conditions, except that there is some thickening of the broad ligaments or enlargement of their contained lymph-nodes. The uterus may be freely or partly mobile. It is often impossible to determine whether the thickening is due to carcinoma or inflammation, and such cases must be classed as doubtful. The mass is probably inflammatory if there is a salpingitis and a history of previous inflammation, with a short history of cancer. Examination under deep anesthesia is helpful.

Inoperable.—When there is definite involvement of the parametrium, lymph-nodes, vagina, rectum, or bladder, or metastases elsewhere in the body, the case is inoperable.

Recurrences.—These occur in the vaginal vault or pelvic structures, after operation or other treatment has been carried out.

Available Therapeutic Procedures.—These may be enumerated as follows:

1. Radical operation.
2. Radium.
3. X-rays.
4. Curettage, followed by cauterization.
5. Curettage, followed by acetone applications.
6. Douches.
7. Drugs and constitutional treatment.

Radical Operation.—The improvement in radium therapy technic and the development of high powered x-ray machines, together with the abnormal enthusiasm of some observers, have seemed to create still more dissension among gynecologists themselves, regarding the advisability of performing one of the radical operations for cancer of the cervix. It has been said that "statistics can be made to prove anything, even the truth," and this aphorism is borne out by the conflicting figures reported by various workers. Some men maintain that surgery no

longer has any place in the treatment of cancer of the cervix, while others contend that "it is absolutely certain that radium and cautery cannot cure cancer of the cervix." It is therefore extremely difficult to present a concensus of opinion.

The radical operation has a comparatively high mortality, even in selected cases. However, when a patient can honestly be considered as "operable," it offers the surest means of cure. Some operators elect to apply a prophylactic dose of radium before operation, to preclude implantation metastases during

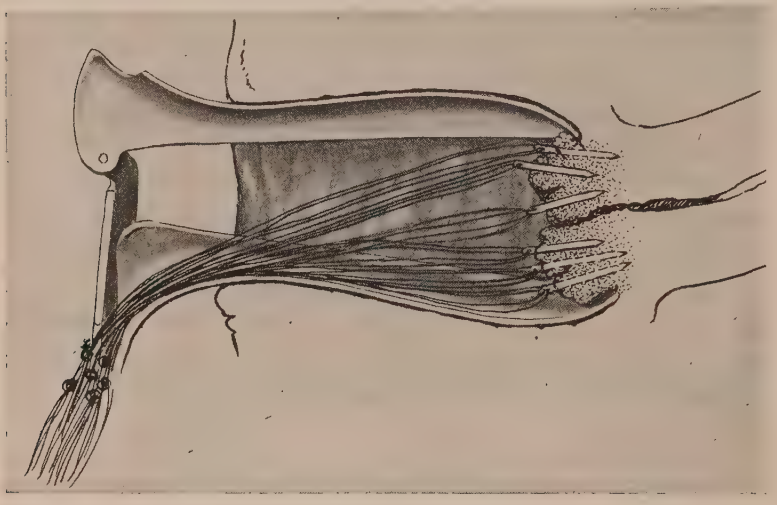


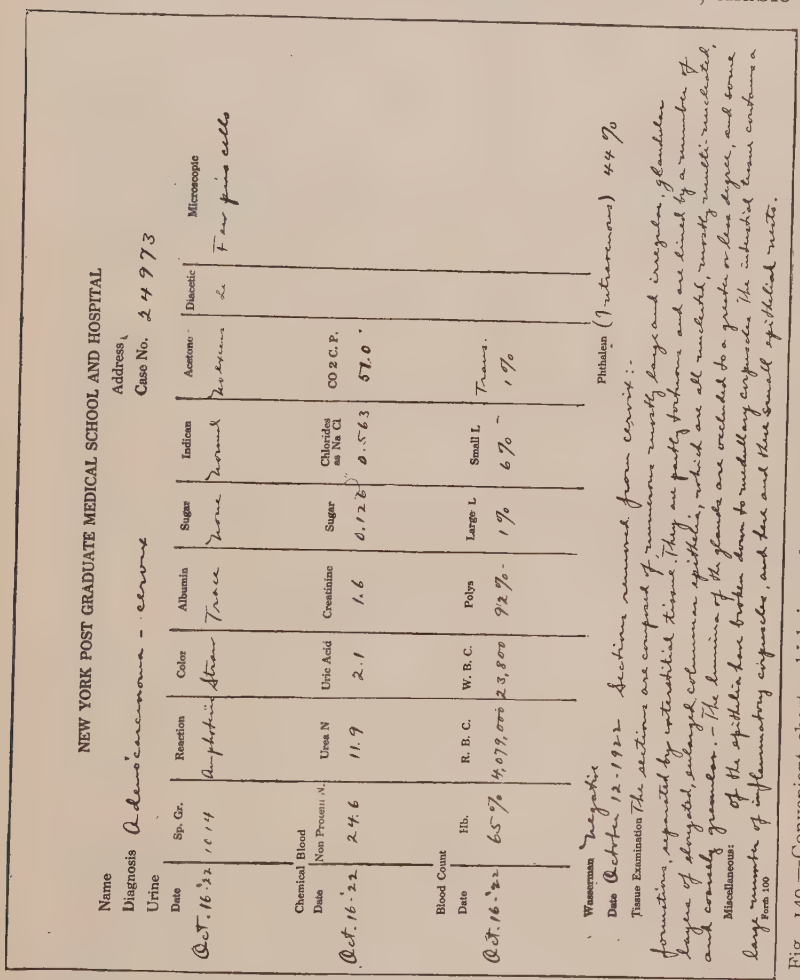
Fig. 148.—Vagina with speculum in half-section, showing radium needles thrust directly into the carcinomatous cervix.

operation, and another group follow the operation immediately with radium or x-ray applications, to anticipate recurrences. Still others use both ante-operative and post-operative radium or x-ray theropy.

In the borderline or doubtful cases, the choice between radical operation and radiotherapy should be left to a gynecologist of wide experience. Every patient must be viewed as an individual problem. It cannot be too strongly emphasized, however, that the operative recoveries and freedom from recurrences are tremendously increased by early diagnosis and prompt operation.

Radium.—While this therapeutic agent is of distinct value,

it is not a cure-all for carcinoma in all its stages. Its curative powers have been greatly enhanced by the recent invention of radium needles, which may be thrust into the tumor mass or adjacent tissues. The needles may contain small quantities of radium salt (5 to 12 mg.), or radium emanations. Such applications, combined with intrauterine treatment, enable the



NEW YORK POST GRADUATE MEDICAL SCHOOL AND HOSPITAL

Name
Diagnosis Adeno-carcinoma - cervix
Urine
Address,
Case No. 24973

Date	Sp. Gr.	Reaction	Color	Albumin	Sugar	Indican	Acetone	Diacetic	Microscopic
Oct. 16-'22	1014	Amphoteric	Straw	Trace	None	Normal	Negative	0	Few pus cells

Chemical Blood

Date	Non Protein N.	Urea N	Uric Acid	Creatinine	Sugar	Chlorides as Na Cl	CO2 C. P.
Oct. 16-'22	24.6	11.9	2.1	1.6	0.128	0.563	57.0

Blood Count

Date	Hb.	R. B. C.	W. B. C.	Polys	Large L	Small L	Trans.
Oct. 16-'22	65%	4,072,000	23,800	92%	1%	6%	1%

Wasserman Negative
Date Oct. 12-1922 Section removed from cervix:
Tissue Examination The sections are composed of numerous irregularly large and irregular glandular formations, separated by interstitial tissue. They are partly tubular and are lined by a number of layers of abnormal, enlarged columnar epithelial cells which are all malignant, mostly multinucleated, and coarsely granular. The lumina of the glands are occluded to a great or less degree, and some of the epithelial cells have begun to undergo cornification. The interstitial tissue contains a large number of inflammatory corpuscles, and the small epithelial nests.

Phthalein (Intramuscular) 44%

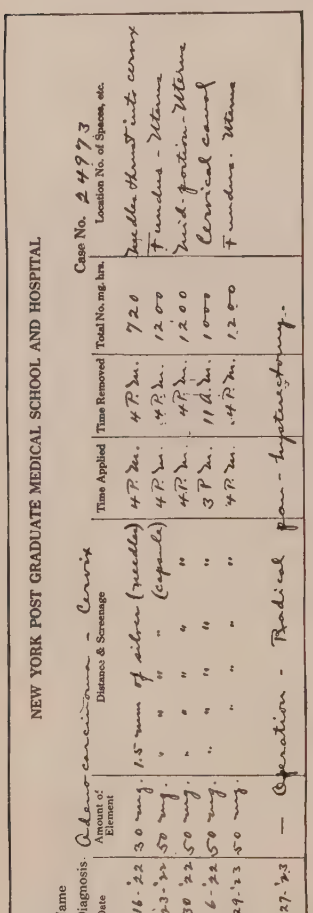
Miscellaneous:

Form 100

Fig. 149.—Convenient chart, which is made part of the patient's case record, for radium therapy. The data appearing on the above specimen sheet comprehends the treatment of the patient whose condition is illustrated in the Frontispiece. (Chart designed by Dr. George S. Willis.)

physician to bring the rays in contact with all parts of the uterus, and permit him to take advantage of the diseased tissues themselves as a natural filter. It is essential to remember that a preliminary study of the patient's metabolic activities and

powers of elimination is as important before radium therapy as before operation. *Pronounced anemia, impaired renal function, or abnormal retention of nitrogenous excrementitious products, are contraindications for vigorous radium therapy, until these derangements have been corrected.*



NEW YORK POST GRADUATE MEDICAL SCHOOL AND HOSPITAL

Name
Diagnosis: Adeno carcinoma - Cervix
Date

Case No. 24973

Amount of Element	Distance & Screenage	Time Applied	Time Removed	Total No. mg. hrs.	Location No. of Spaces, etc.
Oct 16-'22 30 mg.	1.5 mm Pt. silver (needles)	4 P.M.	4 P.M.	720	Both thumb-tacks cervix
Oct. 23-'22 50 mg.	" " " (capsule)	4 P.M.	4 P.M.	1200	Fundus - Uterus
Oct. 30 '22 50 mg.	" " "	4 P.M.	4 P.M.	1200	Ant. Post. in Uterus
Nov. 6-'22 50 mg.	" " "	3 P.M.	11 A.M.	1000	Cervical canal
Jan. 29-'23 50 mg.	" " "	4 P.M.	4 P.M.	1200	Fundus. Uterus
Feb. 27-'23 — Operation - Radical abdominal hysterectomy.					

Fig. 150.—Convenient chart, which is made part of the patient's case record, for radium therapy. The data appearing on the above specimen sheet comprehends the treatment of the patient whose condition is illustrated in the Frontispiece. (Reverse side.)

The following are indications for radium therapy:

1. To control hemorrhage from the growth (needles).

2. To influence directly a fungating, sloughing cervical mass (needles).

3. To convert a borderline into an operable case.

4. To control bleeding, arrest the malignant process, and prolong life in the inoperable cases.

5. To control foul smelling discharge and alleviate the pain in hopeless cases.

6. To prevent recurrences after operation.

Many gynecologists now rely upon radium therapy for the cure of early operable carcinoma of the cervix, and these cases must be included if the method is to be correctly evaluated. It is not fair to restrict its use to inoperable and hopeless cases, and then condemn it if it fails to effect a cure. Again, surgical interference should not be attempted after radium applications until 3 or 4 weeks have elapsed. Otherwise, the operator may be embarrassed by unusually profuse bleeding from the pelvic structures. The operation is advisable, in selected cases, after radium treatment,

as living carcinoma cells may be imprisoned in the connective tissue which results from the irradiation, and these may subsequently become active.

Technic of Radium Applications.—For the convenience of the operator, the uterus is divided into three zones: the fundal (deep), middle, and cervical portions. Each area should receive about 1200 milligram hours treatment, if the patient's

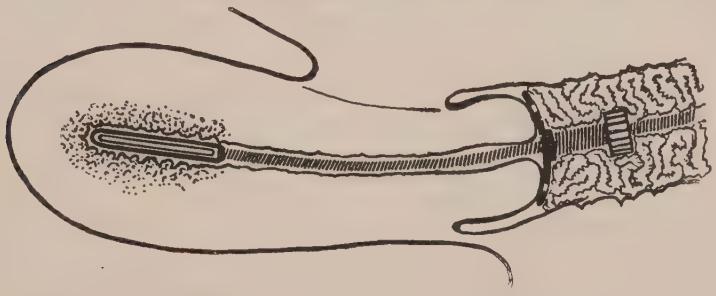


Fig. 151.—Application of radium capsule to uterine fundus (deep).

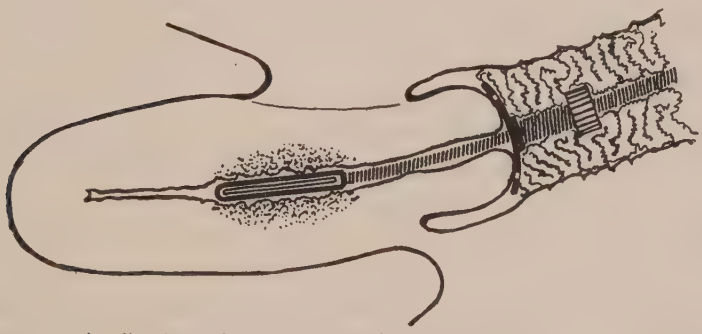


Fig. 152.—Application of radium capsule to uterine fundus (mid-portion).

condition permits. A tube of 50 or 60 mg. is applied to the fundal region of the uterine cavity, to destroy any cancer cells in the fundus, and left for 24 hours. A Pezzer catheter is inserted into the bladder, and the vagina packed with iodoform gauze, to prevent irritation of the bladder and to push the bladder and rectum away from the cervix. One week later a similar application is made to the mid-portion of the uterus, and in another week's time the treatment is applied directly to

the cervical canal. Sometimes, when the patient's condition allows, two tubes of 50 mg. in tandem can be placed in the uterine cavity, thus raying the entire fundus at one time. The cervical zone may be treated with a combined tube and needle application at the same time. When bleeding is profuse, however, it may be necessary to precede all other applications by needles, simply to control the hemorrhage. The bleeding stops about the fifth day. Some cases may be apparently arrested, and then have recurrences later; additional raying is then necessary.

X-rays.—This therapeutic agent has been used in the treatment of cancer for many years, with more or less success. It is significant that the best results have been obtained by specialists in x-ray work.

Whether there is any difference between the biological and therapeutic action of the gamma rays of radium and those of the x-rays has not been determined. Nevertheless, the gamma rays of radium are more penetrating than those of the hardest x-rays, and are therefore probably more selective in their biological influence. In using radium the element can be brought in close approximation with the tumor, and there is very little diffusion of the rays, whereas in using x-rays, the rays originate at the focal point of the target and must travel a considerable distance to reach the objective point. This implies a possible undesired effect on the skin and interposed tissues, as well as more or less divergence of the rays in the deeper structures. The same local effect can be obtained by radium without the severe general reaction so often observed after deep x-ray therapy. However, the scarcity and almost prohibitive cost of radium preclude its universal application, while the x-rays are available on almost every hand.

The recent construction of tremendously high powdered x-ray machines, delivering as much as 200,000 volts, and the development of the Coolidge tube, have added to the enthusiasm of workers in this field, particularly in Germany. The ionization methods of computing the intensity of the x-rays have made it possible to determine fairly accurately the percentage of the surface amount which penetrates to a certain depth. By the

use of several small fields of entry and cross-firing, efforts have been made to increase the fraction of the total quantity entering through the skin, without burning. This fraction is nevertheless relatively small.

Krönig and Friedrich have shown that with 20,000 volts, 50 cm. target skin distance, and 1 mm. of copper filter, a field 5 cm. square delivers 31 per cent. of surface intensity into 10 cm. of tissue, a field 10 cm. square delivers 38 per cent., and a field 15 cm. square delivers 43 per cent. But if an attempt is made to apply a very large dose from several avenues of entry, the normal tissues adjacent to the tumor may sustain serious damage.

X-ray therapy applied to carcinoma of the cervix is essentially a deep treatment. A powerful dosage, symmetrically applied over two large areas is required. Frankl advises 100 to 110 per cent. of the erythema skin unit dose, cross-fired through three to five avenues of entry on the abdomen, three to four routes from the back, and one or two from the perineum. At the same time, he inserts 50 mg. of radium in the cervical canal for 24 hours. It should be emphasized that insufficient dosage is worse than useless, as the x-rays are then irritating, and not destructive. On the other hand, in the prophylaxis after hysterectomy to prevent recurrences, care must be exercised that the tissues are not over-radiated.

Seitz, who is one of the strongest advocates of x-ray therapy, maintains that it is possible to cure carcinoma of the cervix without the aid of any other therapeutic agent, and asserts that twenty-three out of twenty-four patients remaining well for one year prove his contention. No American gynecologist would accept such a short period of relief as a criterion of cure. Such premature conclusions inevitably lead to dissatisfaction and disappointment.

Curettage, Followed by Cauterization.—When a case of carcinoma of the cervix is found to be inoperable, and neither radium nor x-rays are available, the degenerated mass can be removed by curettage. Great care must be exercised to avoid perforating the uterus or entering the cul-de-sac of Douglas, as such accidents are almost always followed by peritonitis.

As soon as the curet reaches firm tissue the cavity is deeply cauterized by galvanocautery loops or irons, and then packed with iodoform gauze sprinkled with tannic acid. The vagina is also packed, and all packing is removed on the third day. Pure nitric acid or liquor ferri sesquichlorati may be used instead of the cautery. The bleeding and malodorous discharge are temporarily arrested, the general appearance of the patient improves, and not infrequently there follows a gain in weight. When the old symptoms return, the curettage and cauterization may be repeated. Under this palliative treatment, life can sometimes be prolonged for a year or two. In some cases of carcinoma of the portio, it may be preferable to do a high amputation of the cervix with the galvanocautery knife. Large doses of morphin are usually necessary for the relief of pain.

J. F. Percy contends that cancer cells cannot be transplanted after an exposure of 45° C. of heat for ten minutes, and devised an operation consisting of the application of electrically heated irons to the cancerous field. The irons are kept at a constant moderate temperature and introduced through a specially constructed water-cooled speculum. Through a laparotomy wound an assistant keeps his hand on the uterus, and determines thereby when the heat is approaching a danger point. This operation, however, has proved disappointing in the hands of most gynecologists.

Curettage, Followed by Acetone Applications.—This method of treatment was originated by Gellhorn. Its advantage over the cauterization technic is that it can be carried out without general anesthesia. The necrotic tissue is removed with a sharp curet, and the resulting firm-walled cavity quickly sponged clean. It is then packed firmly with gauze wrung out in very hot water. This checks the bleeding and is held in place while the patient is elevated in the Trendelenburg position. After smearing the vulva and vagina with vaselin, the gauze pack is removed. A large Ferguson speculum is introduced and held snugly in the fornix, completely surrounding the cervical crater. Pure acetone is poured into the speculum so that the last inch is filled, and left in contact for thirty to forty-five minutes. It is then soaked up on cotton wipes and the

cavity dried. A long tampon is inserted and left in place for several days. This treatment may be repeated twice a week.

Douches.—The most efficient douches in carcinoma cases are carbolic acid, 1 per cent. or lysol, 1 per cent. for cleansing, formalin, 1 per cent., or acetone, for controlling the foul odor, and alum and zinc sulphate, or tannic acid to check hemorrhage. Peroxide of hydrogen may be injected into the vagina.

Drugs and Constitutional Treatment.—Tonics, such as iron, arsenic, and strychnine, etc., are necessary to conserve the patient's vital resistance. Sedatives, such as bromids, luminal, and later morphin, are essential for the relief of pain. Laxatives should be given freely to overcome the constipating effect of morphin, and promote elimination. Ergot and other uterine astringents diminish the uterine congestion and limit the bleeding.

TREATMENT OF CARCINOMA OF THE CORPUS UTERI

Involvement of the parametrial structures and lymph nodes occurs late in the disease. The treatment is therefore always complete hysterectomy, unless the condition has progressed so far that it is hopeless. Under the latter circumstances, the same palliative measures described for cancer of the cervix may be employed.

A fecundated ovum embeds itself in the lining of the uterus through centrifugal descent. The ovum then causes a reaction in the surrounding tissue and a dilatation of the surrounding lymph-spaces, so that a resulting localized edema takes place. In addition, a dilatation of the capillaries is produced.

The Trophoblast.—The outer layer of the ovum develops into what is known as the trophoblast, which is a product of the ectoderm, and from it develop the cells of Langhans and the syncytium.

Shortly after the ovum is embedded in the mucosa a connection between the trophoblast and the material blood is established through a rupture of the capillaries. The maternal blood then bathes the ectodermal trophoblast. This opening of the maternal vessels occurs, however, before the formation of villi; and the cells of the trophoblast may therefore enter the maternal veins at the very earliest period.

A gradual transition of trophoblast cells into syncytial cells, and a gradual change of trophoblast nuclei to syncytial nuclei, take place through the corrosive action of the maternal blood, and elements of maternal blood aid in forming the syncytial protoplasm. The syncytium does not originate from the maternal endothelium, or from the uterine epithelium, or from the decidua cells (Fig. 137).

Just as in the early stages the trophoblast invades the decidua, so after the formation of villi the future course of the ectodermal trophoblast and of the syncytial cells is of a destructive character, so far as the decidua is concerned. The trophoblast and syncytium invade the maternal tissue and mingle with it. They infiltrate the decidua and bring it to destruction. The trophoblast and syncytial cells erode the capillaries and blood-vessels, the blood in turn changing fetal cells to syncytium.

The invading trophoblast and syncytial cells have at all times a great power of migrating. They enter between bundles of

muscular and connective tissue, into the lymph-spaces and into the blood-vessels. At full term the uterine wall is infiltrated with fetal cells of a syncytial character.

From the very earliest moment fetal cells are continually entering the blood of the mother, not only in the primary intervillous space, but in the fully formed intervillous space, as well as through the vessels of the uterine decidua and wall.

Characteristics of Chorioepithelioma.—There have been observed and reported several hundred cases of a uterine growth of exceedingly malignant character, occurring after abortion, hydatid mole, and labor, and even after tubal abortion.

The clinical symptoms are: (1) Pronounced uterine hemorrhage, recurring even after repeated curettings; (2) very early metastases, especially in the lungs and vagina; and (3) early death through hemorrhage, cachexia, or septic infection.

Macroscopically, these tumors are more or less localized, ulcerating, degenerating, hemorrhagic growths, frequently passing deeply into the uterine wall, or through it with involvement of the peritoneum.

Microscopically, these tumors are identified by hemorrhagic areas, areas of degeneration, the presence of fibrin, and the involvement and invasion of capillaries and large vessels. They are especially characterized by the presence of (1) pale round and polygonal cells with pale protoplasm and pale nucleus, and (2) large round and spindle-shaped cells with dark nuclei, and also (3) large, irregular branches composed of multinuclear protoplasmic masses (syncytium).

These typical growths have been variously described as sarcoma, carcinoma, carcinoma after abortion and labor, and as sarcoma causing abortion.

Sänger, in reviewing these cases, found a decided resemblance in their characteristic elements, and came to the conclusion that the decidua cells were the cause of the growth, giving it then the name decidual sarcoma or decidua malignum.

As a result of the investigations of Fraenkel, and later of Marchand, attention was called to the fact that those cells which so closely resembled decidua cells were really of fetal origin, and were, in fact, the cells of Langhans, while the spindle-shaped and

grouped masses of multinuclear protoplasm were of syncytial origin.

From all sides, especially in England and Germany, this view was attacked. It was pointed out how baseless was the statement that fetal cells could produce a growth of this malignant character, differing from carcinoma only in the fact that metastases resulted through the blood-channels instead of through the lymph-channels.

A few years ago the controversy was not entirely settled, many holding the view that these tumors were sarcomata and originated from the decidua cells. The giant cells and the protoplasmatic masses were referred, likewise, to changes in the decidua. Others held that these growths result from the epithelial covering of the villi. That these cells, if they are of fetal origin, should be mistaken for decidua cells is a natural error, for even in the normal processes a positive distinction is often very difficult. It is to be noted that many investigators have mistaken the typical trophoblast cells in tubal placentation, too, for decidua cells. Still others are inclined to the view that the stroma of the villi plays a part.

On the other hand, among those who held that these growths originate from the chorionic covering, a division of sentiment existed, for those who consider the syncytium and cells of Langhans to be of uterine origin classed these growths as carcinoma and sarcoma of a somewhat atypical character. Those who believed, as we have shown, that the epithelial covering of the villi is of fetal ectodermal origin, and who also classed these tumors under the category of carcinoma, have introduced a new element into pathology.

A factor which has served to clear our views in these various disputed points is the knowledge that 50 per cent. of these malignant uterine growths, commonly known as deciduoma, follow the presence of hydatid mole.

Histopathology of Chorioepithelioma.—In hydatid mole there are the same elements as in normal placentation, but they are excessive in number and size. Hydatid mole represents a hypertrophic growth of the chorionic covering, accompanied by dropsical swelling of the chorionic stroma. As is well known,

the covering of the villi consists of two layers—an outer, syncytium, and an inner, the cell layer of Langhans. The growth concerns both the syncytium and the cell layer of Langhans. The abnormal element is the occurrence of very large cells with immense nuclei in large number, and a decided growth of the

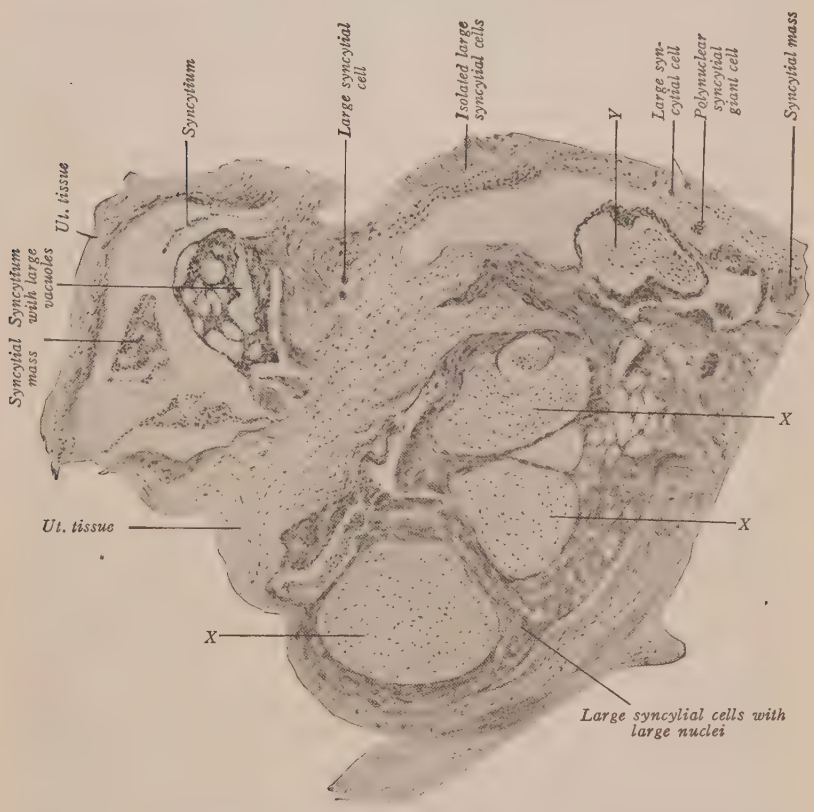


Fig. 153.—Low-power drawing of the typical form of chorioepithelioma, showing the uterine wall invaded by chorionic elements. *X*, *X*, *X*, three areas of dense connective tissue surrounded by chorionic epithelial elements and resembling chorionic villi. *Y*, connective tissue center surrounded by a polynuclear syncytial mass of considerable thickness, probably a villus.

syncytium, accompanied by the formation in the latter of large vacuoles.

Leaving out of consideration those cases malignant because of the diffuse and deep infiltration of the uterine wall by the cystic villi all hydatid moles by no means are of a malignant character.

A method of distinguishing between the benign and malignant cases was proposed by Neumann. He observed in three cases subsequently resulting in the so-called deciduoma, large cell elements in the stroma of numerous villi, which he considered to be infiltrating elements of the syncytium. He observed, further, an abnormal infiltration of cell groups through such syncytial elements. But investigation of subsequent cases shows that malignant forms are not always preceded by such changes in the hydatid mole, while others have found these changes and yet no malignant growth has occurred.

Even the occurrence of metastases is no proof of malignancy, for Pick reported a case with a metastasis of villi in the vagina, and yet the patient recovered. We know that fetal cells are given off at all stages from the normal placenta into the maternal circulation. Even the normal placenta, Pick believes, may give off metastases of villi, and these may (1) degenerate, or (2) grow slightly, or (3) produce the same syncytial growth as is observed in benign hydatid mole; and (4) primary malignant growths may originate, and have originated, from such metastases.

Typical and Atypical Forms.—Under chorioepithelioma we distinguish two forms, the typical and atypical. In the typical form we find large, round, polyhedral cells, with strikingly large, very irregular, lobulated nuclei, which stain very deeply and often degenerate, forming vacuoles. The protoplasm is relatively scanty. These cells are capable of migrating and are found more or less isolated between the muscle and the connective-tissue bundles, in the lymph-spaces, and in the vessels. They form the advance guard in the way of infiltration. There are, further, irregular bridges of protoplasm containing scattered or grouped nuclei of various sizes.

Many of these groups of nuclei are the same large, irregular, lobulated nuclei as are observed in the form just mentioned. In addition are found irregular masses of protoplasm containing many small nuclei. The character of the latter is identical with normal syncytium.

The irregular groups of protoplasm containing grouped nuclei of various sizes are undoubtedly of syncytial character, for they

result through the blood surrounding and infiltrating the cells of Langhans, and it is very evident that these cells form the aforementioned grape-like nuclei. The isolated large cells are likewise of syncytial character. They have generally been mistaken for decidua cells. They may be distinguished from the cells of Langhans, for the latter are pale, polyhedral groups of distinctly epithelial character. They are rich in glycogen, and therefore often contain vacuoles. The nuclei are large but pale.

The cells of Langhans are conspicuous in the atypical form, where the syncytial elements are relatively in the background. In fact, no more and no different syncytial cells are present than in normal gestation. The trophoblast cells lie closely grouped and surrounded by syncytial elements in quite the same manner as in normal gestation, or especially in tubal gestation. They are polygonal cells, concerning which different views have been held. They have been called decidua cells. No vessels of their own, however, are present in these epithelium-like groups, and their character, their structure, and their arrangement so closely resemble the trophoblast cells observed in normal gestation that any other view is not to be considered. These epithelium-like cells and the syncytial masses of various forms all originate from the trophoblast cells.

Fetal Origin of the Tumor.—In these growths newly formed villi have not been found—a proof of the limited power of differentiation possessed by the trophoblast cells alone when acting apart from a living ovum and without the presence of mesoderm. It may be said, therefore, that two forms of this tumor exist, the first typical, the second atypical. The former cases are so characteristic that they cannot be mistaken. The latter have been so frequently called carcinoma by eminent authorities that my belief that many of these are overlooked and incorrectly diagnosticated is probably correct.

A study of the histology of so-called deciduomata, and a comparison of their structure with the structure of normal placental elements, prove these tumors to be fetal in origin. The cells from which they develop are the cells which cover the chorionic villi. Since they are epithelial in character, these tumors,

belonging as they do to the most malignant form, should be called chorioepithelioma.

Characteristics of the Growth of the Tumor.—In the chorioepithelioma there is a reproduction of the same constituent elements as are found in normal placentation and as are observed in benign and malignant cases of hydatid mole. These cells exert the same influence and effect on the maternal tis ues as do the fetal cells in a normal uninterrupted pregnancy.

They invade, as do the normal trophoblast cells, the maternal decidua and destroy it. They infiltrate and erode the walls of the vessels. They invade and infiltrate deeply, too, the uterine wall. They advance, either as distinct Langhans or trophoblast cells, or as syncytial cells, or else they undergo in their advance a change from the former to the latter, especially when in contact with maternal blood, as in the case of placentation, either uterine or tubal.

Their invasion of the maternal vessels and capillaries gives them, from their earliest existence as malignant cells, the opportunity of invading the maternal circulation, with a resulting early formation of metastases. Their ability to erode the vessels causes profuse and constant bleeding. Their ability to destroy the maternal tissue as they advance produces larger and smaller areas of degeneration and necrosis accompanied by the presence of much fibrin. These cells preserve their ability to grow when they reach their new locations, with the result that they produce in the various organs, but most frequently in the vagina, malignant nodules of the same character as the parent growth. In fact, these secondary nodules have in some cases been observed before the character of the uterine symptoms has called attention to the presence of malignant conditions in the uterus.

The fetal cells producing a chorioma are situated in the most favorable surroundings. They have been performing practically malignant functions in that they have destroyed, even during normal placentation, maternal tissues, have invaded maternal vessels, and have been carried off into the maternal circulation. When intimately connected with an ovum, when feeding and nourishing the fetus with the products of the maternal blood

which have passed through them, they are, so to speak, under control of the parent organism, the ovum; yet when released from this connection they continue an independent growth of their own. It is quite probable that in hydatid mole the edematous swelling of the chorionic stroma is due to interference with the proper exchange between the fetus and the mother, due to a more or less increased and independent growth on the part of those cells whose function it is, normally, to aid and permit of this exchange. It is likewise probable that the growth of the chorionic cells in chorioepithelioma takes place during the pregnancy and is more often the cause than the result of abortion.

The Relation of Ovarian Secretion to Chorioepithelioma.—In the development and change of trophoblast cells to syncytium it is apparent that the closely grouped cells, when vascularized, change to plasmodial or syncytial cells. That the blood of the mother furnishes the greater portion of the protoplasm of these syncytial cells has been clearly shown. Therefore their production and growth, even in normal conditions, depend upon their taking up directly from the mother elements essential for the formation of protoplasm, while the trophoblast cells themselves furnish the nuclei. Therefore the growth of so pathologic a tumor as a chorioepithelioma is not absolutely a reproduction of fetal cells, but is in a more or less direct manner a direct maternal production also.

The invasion and destruction of maternal tissues in normal gestation occurs within certain fixed limits, and the fetal cells entering the maternal circulation undergo no further growth. What preserves this balance? What limits and controls the potential of the parasitic fetal cells? In hydatid mole, and especially in chorioepithelioma, the fetal cells are no longer held in check, and they possess the power of unlimited growth. What has upset the normal balance?

When the fecundated ovum enters the uterus it destroys the surface epithelium under it and descends actively into the decidua. It produces a decided reaction in its immediate circumference, so that even in its earliest stages it evidences a biochemical power. When the natural blood makes its exit

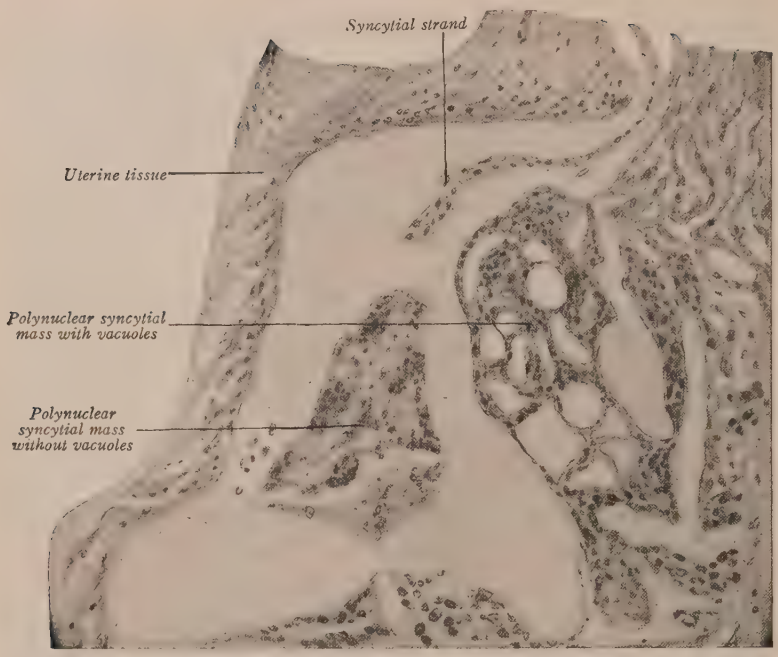


Fig. 154.—Upper left-hand corner of Fig. 153 highly magnified, showing the character of the polynuclear syncytial masses. Along the right and lower borders are larger isolated mononuclear syncytial cells.

Fig. 155.—Highly magnified area of Fig. 154 showing finer characteristics of syncytial masses. Change of trophoblast cells *en masse* into polynuclear, vacuolar structures.

from the capillaries, it ought to coagulate but does not. It circulates against the fetal cells which have the power to prevent

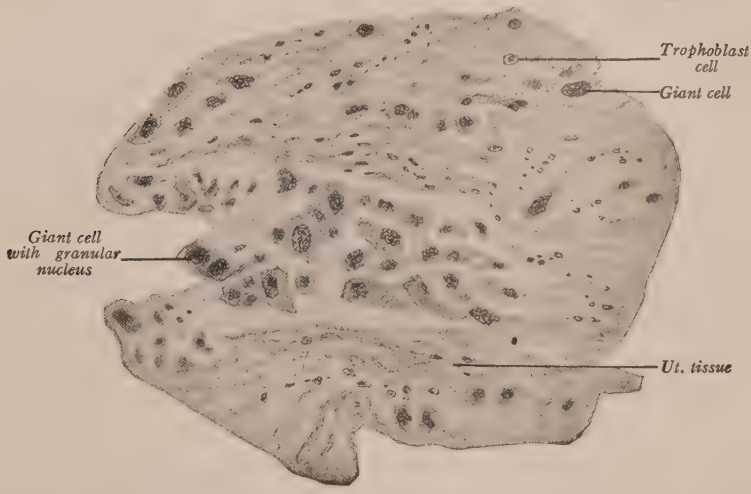


Fig. 156.—Highly magnified area of Fig. 153 showing character of isolated mononuclear giant syncytial cells and the infiltration by them of the uterine tissue and lymph spaces.

Fig. 157.—High-power drawing of atypical chorioepithelioma greatly resembling carcinoma.

coagulation. The trophoblast and syncytial cells are bathed by maternal blood and enter the circulation; therefore the

ovum has a certain enzyme action, and the fetal cells may be said to furnish or represent a placental secretion.

On the other hand, the blood contains elements which exert a corrosive action on the trophoblast cells, changing them to syncytium. The resulting syncytial cells then cover the villi; they play the part of endothelium (which they then greatly resemble), and prevent the cells of Langhans and the stroma from further corrosive change by the blood. That the individual cells in chorioepithelioma have the power to grow without limit, and that the cells entering the circulation have the energy to produce malignant metastases, shows that the decidua and the blood no longer have the power to limit and control their growth.

Chorioepithelioma, occurring generally after abortion or hydatid mole, is probably the cause, rather than the result, of the abortion. Chorioepithelioma represents a more advanced stage than that of hydatid mole, but both of these conditions, in a basic way, follow the normal processes in their course and growth. The only difference is *the power of unlimited growth* possessed by the chorionic cells in these pathologic conditions. The difference in the resistance offered by the patient points to a constitutional element, *the lack of some normal secretion*, as an important factor in the etiology of chorioepithelioma.

It may be said that chorioepithelioma is due to the fact that resistance to the fetal enzymes and fetal cells offered by the blood and a secretion, probably the ovarian secretion, is insufficient to hold the growth of the fetal cells in check. Every case of hydatid mole should be closely followed and the possible development of chorioepithelioma should be held in mind. If, after abortion or labor, the uterus does not return to normal size, if irregular or profuse bleedings develop, the existence of a chorioepithelioma should be considered as a possibility. The scrapings after curettage make the diagnosis. To the finger, introduced into the uterus, the feel is like that of a carcinoma. This condition may develop even two to three years after labor.

Treatment of this condition consists of panhysterectomy.

FIBROMYOMATA

Myomata or fibromata or fibromyomata of the uterus, commonly called fibroids, are tumors which arise and develop interstitially in the wall of the uterus and from their subsequent situation are known as *submucous, interstitial, or subperitoneal.* From what these tumors originate is not known. It is probable that they are due to cells displaced during the fetal development of the two ducts of Müller into the genital tract, and to failure of trophic control over the uterus by the ovaries.

Fibromyomata are originally multiple, but not all of them develop. Generally one develops greatly, overtops the others, and is surrounded by smaller ones. Sometimes there is a group of fair-sized tumors. All fibromyomata are originally interstitial.

Fibroids are present in many uteri, but never progress to any extent. We often see them developing in pregnancy and undergoing involution later. These are pure myomata, composed of muscle tissue, which undergo the same involution changes as the uterine muscle does after labor.

Fibroids may be very small or very large. They may cause such symmetrical enlargement of the uterus that the resemblance to pregnancy is marked, or they may give it an irregular outline through multiple tumors extending into the general abdominal cavity or into the broad ligaments or into the cul-de-sac of Douglas.

They may be situated in the cervix or fundus. If situated sufficiently far down in the cervix, they may develop retroperitoneally by pushing up the peritoneum which lines the cul-de-sac of Douglas. They may be broad-based or pedicled and their connection with the uterus may be lost by thinning and absorption of the pedicle. They usually move with the uterus, but if pedicled they move independently. If intraliga-

mentous or subperitoneal they are less movable. Adhesions may limit their mobility or they may be firmly incarcerated in the pelvis.

Myomata are round, but when stretched and changed by pregnancy they become broader and flatter. They consist of connective tissue and muscle. The more connective tissue, present, the harder they are. A pure fibroma is very hard. A pure myoma is quite soft. Fibroids become harder through calcification or sclerosis of the connective tissue. They become softer in pregnancy or through fatty degeneration. They become soft and cystic or larger through necrosis, inflammatory changes, lymph-cyst changes, hemorrhage, etc.

Fibroids are by no means an obstacle to pregnancy, and their effect on the course of gestation depends upon their situation, on the amount of hemorrhage associated with them, and upon the manner of their growth, for by this latter change room for the growing ovum may be limited. A differential diagnosis between a fibroid uterus, evenly enlarged and of soft consistence, and pregnancy must often be made.

Fibroids usually increase in size during pregnancy and often diminish and disappear after labor, being then of the form called myoma rather than fibroma. The position of a fibroid or fibroids may interfere with or obstruct the progress of childbirth, but rarely does so absolutely. Conservative action often causes, even after many hours, a spontaneous change of position of the fibroid tumor, so that labor is ended normally. With absolute obstruction a laparotomy and Cesarean section are necessary.

Fibroids supposedly shrink or cease their growth at the menopause age, because the congestive stimulation of the ovarian secretion ceases and a state of pelvic anemia results which fails to furnish the fibroids with proper nutrition. On the other hand, they may prolong menstruation for years beyond the menopause age. They often grow rapidly at this period instead of disappearing. The most dangerous changes occur at this time just because of the lack of sufficient blood-supply, and fibroids may increase rapidly in size. They may grow rapidly by actual increase of tissue or by degeneration

of their structure accompanied by necrosis, hemorrhage, etc. A fibroid may degenerate in structure in various areas, or it may even undergo purulent degeneration. Fibroids become readily infected by intrauterine examination, or if they extend through the cervix into the vagina where they come in contact with vaginal bacteria. Fibroids may become separated from the uterus and be nourished parasitically by union with the omentum, tubes, ovaries, bladder, or intestines. Very large vessels run from these structures to the fibroid and supply it with blood. The twisting of this arteriovenous pedicle of blood-supply may cause ascites. Carcinomatous changes are very rare, but sarcomatous changes occasionally occur. Evans, of the Mayo Clinic, found 72 of 4000 myomata to be malignant. Berreiter found 6 in 716 cases. Carcinomatous changes in a fibroid take place only when some of the epithelium which lines the uterine cavity is taken up into the structure of the fibroid by its growth, thus becoming separated from its parent endometrium.

Symptoms.—The most common symptoms which fibromyomata produce are increase in size of the uterus, generally with enlargement of the uterine cavity, and bleeding, especially in the submucous and sometimes in the interstitial variety. They rarely cause pain, unless incarcerated beneath the promontory of the sacrum or unless the blood which is poured out coagulates quickly and is expelled from the uterus as large clots. Fibromata in their growth are surrounded by a zone rich in blood-vessels, for in the fibroid itself the blood-supply is poor. Either this zone comes close to the surface of the uterine lining or else the mucosa over the fibroid is in a state of hyperplastic development, or else it is thinned out, or else the surface of the fibroid projects in broad-based or polypoid form into the cavity of the uterus. Under such circumstances bleeding, which is generally of the form of menorrhagia, may sometimes take the form of metrorrhagia. Hemorrhage is most marked in the submucous or polypoid form. In fibroids situated interstitially, and especially subperitoneally, irregular bleeding is rarely a symptom. They evidence themselves then mainly through the increased size of the uterus and through the

pressure-effects on the surrounding structures, such as intestine or rectum, bladder or ureters.

In addition to hemorrhage, which may be of the form of menorrhagia or metrorrhagia, there may be pain through weight and pressure of the fibroid; there may be dysmenorrhea due to the expulsion of large clots through the cervix, or there are evidences of pressure on the bladder, ureters, rectum, or sacral nerves. Incarceration within the pelvis of uterine, and especially of cervical, fibroids may compress the bladder, causing great distention of that organ, with pain and constant dribbling of urine.

Diagnosis.—*An interstitial myoma or fibroma* being situated in the wall of the uterus is covered with muscle fibers. The uterus is of hard consistence. The diagnosis from chronic metritis or fibrosis is difficult if the uterus is not large. In chronic metritis the uterus is evenly enlarged, the cervix and fundus are both thickened. If the uterus is palpated through the abdomen, by manipulation the even or uneven thickening of the uterine wall may be noted. The larger and harder the uterus, the more probable is the existence of a fibromyoma. The uterus is then enlarged, the cavity is lengthened and widened. An interstitial myoma of the cervix gives an irregular knotty wall with an even enlargement of the uterus. The diagnosis from pregnancy in the early months is often difficult, especially from pregnancy with dead fetus.

Subserous fibromyomata are not covered with much uterine tissue, but with peritoneum. They are broad-based or pedicled. They may be apparently separated from the uterus. They may grow intraligamentous and can become separated from the uterus. If deep down in the uterus or if in the cervix, they may grow under the cul-de-sac peritoneum, push it up, and become retroperitoneal. A fibroid may, from such an origin also become intraligamentous. The diagnosis of subserous myomata is often difficult. An effort should be made to palpate the round ligaments over the tumor. A sound shows the uterus to be always enlarged, except with subserous pedicled tumors. With pedicled myomata the uterus preserves its form. Then a differential diagnosis from ovarian tumors is necessary.

Submucous fibroids, whether broad-based or pedicled, grow toward the uterine cavity and are covered with mucosa. If such a fibroid grows into the uterine cavity it dilates the uterus and the cavity is lengthened and widened. It stimulates the uterus to contraction, which may cause the fibroid to protrude from the cervix as a fibrous polyp. The submucous type causes profuse bleeding. The uterus is enlarged and round, the portio is felt to merge with the enlarged uterus. A submucous fibroid often dilates the cervix and the lower uterine segment like a balloon. A differential diagnosis must be made from pregnancy and from metritis.

In the differential diagnosis of fibroid from pregnancy it must be remembered that in the latter there is amenorrhea, morning nausea, colostrum in the breasts. On bimanual examination the pregnant uterus undergoes in the course of a few minutes changes in consistence. Later on fetal movements can be felt and the fetal heart can be heard. A still more difficult diagnosis is that of early pregnancy combined with fibroids. Amenorrhea is not always a symptom, for bleeding, which is often a symptom of fibroid, may be present. The other symptoms of pregnancy and the softer condition of the uterus are points of importance. A fibroid uterus may stimulate the breasts to secretion of milk, so that this element is not of absolute value in a differential diagnosis.

With a living fetus the most important sign is the change of consistence which the uterus undergoes in the course of a few minutes under bimanual examination. The myomatous uterus is usually harder. In the later months the symptoms of pregnancy and the evidences of fetal movements and the pulsation of the fetal heart make the diagnosis.

Not infrequently a differential diagnosis must be made from retrouterine hematocele. The latter, however, becomes harder and harder after the blood has coagulated, and causes peripheral adhesions and is more closely connected with the pelvic walls. In differentiating an intraligamentous fibroid from intraligamentous hematoma it is to be noted that the latter shrinks

gradually. With fibroid the uterus is enlarged, but in many cases the differential diagnosis is difficult and can only be made after continued observation. A retrouterine fibroid must be distinguished from the retroflexed fundus by rectal examination and by the use of the sound. The cervix is dilated during menstruation, and if the finger is then passed into the cervix, a foreign body is felt in the case of a *submucous fibroid*. This must be differentiated from an ovum or the retained products of an abortion. It must be remembered that an ovum or any of its retained parts may be loosened from the wall of the uterus by the examining finger, whereas a fibroid cannot. A retained placenta may be so firmly adherent as to be diagnosed as a submucous fibroid until its removal makes the correct diagnosis. Mucous polyps are distinguished by the fact that they are oval, lobulated, and soft, and have a thin pedicle.

Fibromata are generally recognized in the thirties of a woman's life. Organic myocardial or functional cardiac changes are noted in 30 to 40 per cent. Fibroids cause changes in the liver and kidneys through loss of blood, pressure-effects, and intoxication.

Sequelæ.—Boldt says: "The close relation between myomata and cardiac degeneration has been frequently alluded to in gynecologic literature for many years, but even the very latest text-books fail to give myomata a place as etiologic factors of cardiac degeneration. Yet the circulatory symptoms frequently observed in patients having uterine fibroids suggest that there is some relation between these neoplasms and the circulatory apparatus, showing that these growths produce a detrimental effect on the circulatory system. Cardiac changes in women having fibromyomata occur too often for one to simply consider them as a mere coincidence." Of seventy-nine recent cases of fibromata, Boldt found in thirty-seven patients (nearly 47 per cent.) some circulatory disturbance. He finds five classes:

Class 1.—Dyspnea on exertion, also a small, rapid pulse with arrhythmia. There is moderate hypertrophy of the right ventricle.

Class 2.—Orthopnea and irregular and intermittent pulse; increase of dullness over the entire cardiac area; hepatic dullness slightly increased; albumin and casts in the urine.

Class 3.—An arrhythmic, hard pulse, with occasional attacks of anginal pain. In the urine there is a trace of albumin, and there are some granular and hyaline casts.

Class 4.—A rapid pulse, from 100 to 126 beats a minute, which on sudden exertion increases from ten to twenty beats; the pulse is small and easily compressible. The patients are easily fatigued on exertion. The urine is normal.

Class 5.—Includes the largest number. There are no symptoms referable to the heart, but the pulse is small, of low tension, occasionally irregular, from 86 to 110 beats a minute. Pain on pressure over the second sternointercostal space is noted in half the cases, associated with pain on pressure over the apex. There is a trace of albumin in the urine in some cases, associated with occasional granular and hyaline casts. There is no appreciable change in the heart area in any of these cases.

"One must regard the degenerative condition of the heart muscle as being to a large extent, if not entirely, a cause of fatal termination."

Fleck states that "myofibrosis of the heart may also occur as the cardiac lesion in connection with myomata of the uterus; further, that the lesion in connection with myomata resembles that of myocarditis, without being exactly identical with it. Brown atrophy, however, is anatomically recognized as a lesion frequently associated with myomata." In his conclusion he maintains that myomatous uteri are frequently associated with an affected heart muscle, which can be caused only by the action of poisonous substances. Myomata are invariably associated with gross anatomic changes of the ovaries, and from this source Fleck believes the poisonous products to originate.

Leopold and Ehrenfreund, in three cases of death among their last fifty-one vaginal hysterectomies, found fatty degeneration of the muscle and numerous pulmonary emboli, also thrombosis of pelvic veins and those of the lower extremity. Fatty degeneration of the kidneys was also present in one of these cases and parenchymatous nephritis in another.

Boldt says: "That a relation exists between myofibromatous tumors and degenerative changes in the heart and other circulatory changes is sufficiently accepted by competent observers to cause us to consider these tumors dangerous to life from other causes than degenerative changes in the tumors themselves. In fact, the malignant changes in these tumors do not so frequently give rise to a serious aspect as do the degenerative changes in the circulatory system."

"Women who have sustained large losses of blood frequently show symptoms of anemia, manifesting itself in cardiac palpitations, dyspnea, edema of the lower extremities, and more or less albuminuria. These symptoms often disappear on the cessation of the bleeding, but if the attacks of bleeding frequently repeat themselves, such symptoms are likely to become permanent and leave their effect on the heart muscle. That such effect on the heart is not alone caused by menorrhagia and metrorrhagia is proved by the fact that degenerative changes in this organ are also seen in patients who have not suffered such large losses of blood as the result of the tumor (in Fleck's cases, brown atrophy was especially found in the patients who had no hemorrhage), and their absence in women who have sustained large losses of blood from causes other than myomata. There is no particular form of cardiac degeneration distinctly attributable to myomata, but we know that there are various pathologic conditions of the heart, blood-vessels, and kidneys frequently associated with myofibromatous tumors of the uterus, and that the effects which frequent and profuse hemorrhages produce, manifest themselves in fatty degeneration and brown atrophy of the heart muscle. Clinical experience has taught us that patients with myomata have a weak heart, especially if the tumors have attained considerable size, and cardiac weakness may lead to *venous thrombosis*, especially in the pelvic and femoral veins, and then to pulmonary embolism. There can be no question that patients with fibroids of long standing have their resistance to anesthetics impaired; their pulse is frequent, small, and easily compressible, and sometimes irregular. They complain of inability to undergo physical exertion, tiring very soon, and often complain of *cardiac palpitation*. This lack of resistance frequently manifests itself only when an operation is

undertaken for the removal of a tumor, because at that time the tax on the respective functions is increased. If the heart affection is the primary condition and independent of the myoma, then the removal of the tumor can have no effect upon it, and the progress of the cardiac affection is not interrupted by the extirpation of the neoplasm, but the fact that has been clinically proved, that removal of such tumors has produced a beneficent effect upon the heart, shows that there is a causal connection between the conditions. We know, of course, that some patients may have heart lesions without complaining of any symptoms referable to such lesions. Further evidence of a connection between myomata and the circulatory apparatus is found in the fact that arteriosclerosis of the ovarian vessels is frequently found, also in the pathologic changes in the constituent elements of the blood. Further, myomatous patients frequently begin to menstruate late, have profuse flow, and suffer from dysmenorrhea. The mechanical changes in the heart, like dilatation and hypertrophy, have a position subordinate to the myocardial changes."

"I have stated that cardiac degeneration favors renal changes, but, on the other hand, if a tumor presses on the ureters, renal degeneration may be produced, which, in its turn, may lead to cardiac degenerative changes.

"The changes in the blood-vessels in the immediate vicinity of a myoma have an important bearing on the occurrence of emboli, the enlargement of the veins furthering the development of thrombosis and embolism, both before and after an operation.

"It is exceedingly difficult sometimes to diagnosticate cardiac changes clinically; they may be suspected if there are present respiratory disturbances without demonstrable pulmonary lesion.

"While the size of tumors does not bear any positive relation to the degenerative changes in the heart muscle, we must admit that such changes are more likely to be present in tumors of large size, when they extend above the umbilicus, especially if hemorrhage has been a prominent symptom."

Teratment of Fibromyomata.—The method of treatment selected for a particular myomatous tumor depends to a large extent upon the following factors: (1) the relation of the tumor

or tumors to the uterine cavity, (2) the relation of the growth to other intra-abdominal structures and viscera, (3) the symptoms produced by the growth, (4) the presence of peri-uterine inflammation, (5) the degree of constitutional impairment of the patient, (6) the complications that are present (cardiac and renal diseases, pregnancy, etc.), and (7) the rapidity of growth.

Some fibromyomata require no treatment whatever. They are the small intramural or subperitoneal tumors, probably discovered accidentally, causing no symptoms, unlikely to produce symptoms, and not aggravating symptoms attributable to other trouble. Such tumors should be kept under observation, and if they increase in size or give rise to symptoms later on, interference may be justifiable. Small fibroids situated in the cervix, however, are not included in this category, as they usually produce symptoms, particularly dysmenorrhea or pressure symptoms on the bladder or rectum, and are extremely likely to increase in size during pregnancy and complicate delivery.

Palliative Treatment.—There is another percentage of cases which may be treated conservatively. The palliative treatment is directed towards the alleviation of comparatively slight symptoms. This class includes (1) small submucous tumors which cause moderate menorrhagia or dysmenorrhea, without troublesome intermenstrual symptoms, (2) fibromyomata of moderate size and stationary in character, occurring in women past the menopause, producing slight bleeding only or mild pressure symptoms, (3) patients whose vital resistance is so impaired that they are not candidates for a major operation, radium, or x-rays, and (4) patients who refuse operation, radium, or x-rays.

In many of these cases it is necessary to devote considerable attention to tonic and hygienic measures. The patient should be kept quiet, avoid physical exertion, and keep her bowels open. Anemia is corrected by daily hypodermic injections of iron arsenite and strychnin. Pituitary anterior and placental extract are worthy of trial. Mammary extract in 5–10 grain doses t. i. d. often controls moderate bleeding. Hemostatic remedies such as stypticin, ergotin, calcium chlorid, etc., are

frequently useful. Firm vaginal packing sometimes aids in arresting bleeding and at the same time serves to raise an impacted tumor out of the pelvis. The patient should be kept in bed and the packing changed every other day. Intrauterine packing is unnecessary and may be dangerous. Intrauterine electrotherapy has now been practically discarded. On the other hand, a cautious curettage may control bleeding temporarily, and is extremely useful as a diagnostic procedure. Due allowance, however, should always be made for distortion of the uterine cavity, and care must be exercised that the curet does not wound the uterine wall. Intrauterine applications are hazardous, and any case requiring intrauterine interference needs more radical treatment than applications.

If symptoms persist in spite of palliative measures, some other form of treatment must be considered.

Operation.—The greatest number of cases of fibromyomata demand a major operation. This may be a myomectomy, abdominal hysterectomy, either supravaginal amputation or complete removal of the uterus, or vaginal hysterectomy. Ligation of the uterine arteries, to diminish the blood-supply of the tumor and arrest bleeding, has now been superseded by radium and x-rays.

Myomectomy should be the method of choice in young women, cases of pedunculated fibroids, and in pregnant patients, when the nature of the growth permits. In other cases in which the symptoms become aggravated despite palliative measures, in which the growth is increasing in size, in which bleeding is profuse, in which the uterus is larger than a four months pregnancy, or in which pressure symptoms are pronounced, hysterectomy is advisable, provided the patient's general condition is satisfactory. Supravaginal amputation is the preferable operation, because of its lower morbidity and mortality, except when the cervix is extensively lacerated or diseased, or there has been a recent infection of the uterine cavity, or there is suspicion of malignant degeneration. The hysterectomy should then be complete. Or when the growth is pedunculated and projects into the vagina, or is entirely cervical, or is so low in the corpus that it can easily be removed through the vagina, vaginal hysterectomy is indicated.

Radium.—The question of what cases should be treated by radium or x-ray therapy depends upon accuracy of diagnosis. Radium therapy is an ideal method of treatment for patients in whom operative measures are contraindicated by cardiac or renal diseases or metabolic disturbances, in women past the climacterium, in those in whom sterilization is of no consequence, and in patients in whom the uterus is not larger than a four months pregnancy but are bleeding profusely. One contraindication for the use of radium therapy is the presence of perimetrial inflammation, for the reason that radium treatment invariably provokes renewed activity of an existing infectious process. Degenerative changes, severe pressure symptoms, and urgent symptoms are also deemed contraindications. As in the case of carcinoma, the great advantage of radium therapy lies in the fact that the penetrating gamma rays are brought in direct contact with the tumor. Ovarian function is arrested, bleeding is checked, and amenorrhea follows. Incidentally, sterilization results, an important point to be considered in young women.

A 50 mg. tube of radium, screened with 1.5 mm. of silver, is inserted into the uterine cavity for from twelve to twenty-four hours; a dosage of from 600 to 1200 milligram hours. At the same time, the growth is cross-fired with an external abdominal radiation on a 1 inch block over the tumor and on each side of the pelvis. The tumor shrinks, bleeding ceases, and pressure symptoms are relieved. In certain cases it proves impossible to place the radium capsule in the cervical canal, and it becomes necessary to rely upon external radiation alone. The patient is directed to report in six weeks, and one or two further applications may be necessary at six week intervals.

X-rays.—The x-rays exert an influence similar to the rays of radium, and are used in much the same manner as in the treatment of carcinoma. The technic is practically the same as in the treatment of malignant conditions. Applied by an expert, with modern and proper equipment, and in adequate dosage, x-ray therapy is as efficient as radium treatment. The effects of the two are practically identical.

INFLAMMATION OF THE FALLOPIAN TUBES

SALPINGITIS-SALPINGO-OÖPHORITIS

Salpingitis is an inflammation of part or all of the Fallopian tube. There are three degrees of salpingitis: (1) A mild form, difficult to recognize, which involves the ciliated epithelium and to some extent the mucous membrane. (2) Involvement of the mucous membrane. (3) An interstitial form which involves also the muscular wall and which causes enlargement and thickening of the tube. The third form is generally associated with more or less adhesions, having a tendency to close the outer end of the tube. Cases of a more definite character are to be considered as hydrosalpinx or pyosalpinx. The same variations in the degrees of inflammation are to be noted in salpingitis as are observed in appendicitis. Restoration to the normal, or so nearly to the normal as to present almost no microscopic evidences of disease, occurs in salpingitis as in appendicitis. Restoration to the normal in salpingitis, however, is a process which takes months or years, as can be readily appreciated because of the cocci which are so frequently present in this inflammation.

Etiology.—The elements of infection may enter the tube through the blood-channel (tuberculosis), through the abdominal cavity (tuberculosis, septic parametritis, septic peritonitis, appendicitis), or in the form of an ascending infection from the cervix, either directly through the uterus into the tubes or through the lymphatics of the broad ligaments into the tubes. While it is true that far more frequently than is recognized the exanthemata produce permanent and harmful changes in the uterus, and either primary or secondary changes in the uterus and tubes, yet the causation in the majority of cases of tubal disease is to be referred to the bacteria generally found in the diseases of the urinary and genital tracts.

The bacteria most frequently encountered are the tubercle bacillus, colon bacillus, streptococcus, staphylococcus, and

gonococcus. Infection may occur in children, in nulliparæ, or in multiparæ. The site of the primary infection is in most cases the cervix, or the cervix and uterus, progressing at various times and in various degrees of severity into one or both tubes, or first into one and then into the other, or into one tube and through the abdominal cavity into the other. The cause of salpingitis in nulliparous women may be infection introduced by intrauterine manipulation. In addition to infection, there may be an injury to the tube as a result of intrauterine injections. The cause of salpingitis in nulliparous women without intrauterine manipulations is in most cases a latent unrecognized gonorrhea existing in the form of an endometritis.

It is important to recognize the fact that an injury, even extensive in its nature, may be present in one tube without an apparent involvement of the tube of the other side, or else there may be an involvement of the other side of much slighter degree, which can scarcely be recognized. This association of widely divergent degrees of inflammation may be present even with a pyosalpinx.

The etiology of salpingitis in adults, then, is as follows:

1. The diseases of childhood and gonorrhea in childhood are responsible for some cases when other later sources of infection may be positively excluded.

2. A certain number may be attributed to unrecognized tuberculosis.

3. Others may be referred to infections of a mild type after labor or abortion or curetting.

4. The gonococcus type causes the larger number.

5. An interesting point is the frequency with which lesions of the right side are more pronounced than those of the left. An explanation can be found only in the presence of the appendix, and the associated evidences of appendicitis are rather proofs of the cause than evidences of a complication. An appendicitis, even if only catarrhal, is responsible for some peritoneal irritation and exudation, and it is only natural that the action of the tubal cilia attracts into the tubes, particularly on the

right side, the infecting bacteria, generally the bacterium coli. That, then, would explain the resulting mild adhesions, especially in instances of exclusively right-sided involvement.

Histopathology.—The inflammation of the mucous lining merits special attention. Involvement of the tubal wall and the serous covering is not uncommon. The mucous membrane may be secondarily affected, as is the case when the infectious process makes its way from the peritoneum inward. Through resulting perisalpingitic strands there may occur torsions and displacements of the tube and ovary. The result of an inflammation of the mucous membrane is usually swelling of the folds and hyperemia, which, if they occur in the numerous blood-vessels of the abdominal ends of the tubes, cause serous exudation which leads to adhesions at the abdominal opening, and may result in complete closure. By the forcible stretching which the tube may undergo in the course of such a closure, the entrance to the uterus is made so narrow that even in the absence of real atresia at this point the exit of fluid is impossible.

Whatever may be the cause of such inflammation, the evidences are the same as in other organs. As a result of inflammation we find numerous round cells in the tissue, so that its normal elements are completely overwhelmed by the round cells. The result is a swelling of the folds in the tubal lining, which lie close together and easily become adherent. The epithelium of the surface is usually intact, but the round cells force their way through the epithelium at many points and lie in the canal, which is narrowed by the swelling.

The process does not usually extend deeper. Now and then strands of round cells follow the vessels in the muscularis. As a rule, hyperemia affects the serous covering, and the peritoneum looks very red and swollen, and shows numerous signs of inflammation, leading to the formation of fine membranes. In this way long-standing inflammations cause adhesion of the tubes to neighboring organs.

Diagnosis.—These milder forms of salpingitis are classified as salpingitis, perioöphoritis, salpingo-oöphoritis, etc. The lesions of importance are the slight localized peritonitis, the oöphoritis, and the varicose condition of the broad ligaments.

It is these which cause in patients the annoying symptoms; it is because of these that operative interference is sometimes warranted. This does not refer to large pus tubes, to large tubo-ovarian tumors; but to lesions which the examining fingers scarcely detect as tangible ones. The patients complain of pain and are primarily or secondarily sterile. Examination is generally productive of pain and often divulges the presence of a prolapsed ovary more or less fixed. To this class of patients belong the large number in whom no other than a tubal or peritoneal cause explains sterility, if examination and treatment prove all other requirements to be fulfilled. The Rubin test is of especial value in these cases to determine the patency or occlusion of the lumen of the tubes. It is in this class, too, that operation, primarily for sterility, is justified. Thin cobweb adhesions, closing the outer end of the tube, fastening the ovary in the sac of Douglas, and preventing the entrance of an ovum into the tube are frequently discovered. The ovaries are often of the type of small cystic degeneration. Strange to say, the degree of pain is not always proportionate to the amount or strength of the adhesions, as peritoneal sensitiveness varies and the least pain is often experienced where most justified by local changes. (See Ovarian Dysmenorrhea.)

Sequelæ of Mild Salpingitis.—The two important sequelæ of salpingitis are sterility and ectopic gestation. If both tubes are closed at their outer ends sterility is absolute. However, salpingitis may be present without closure of the outer end. There is an involvement of the mucosa of the tubes, a hyperemia and a swelling of the folds, and very frequently a paraoöphoritis, complicated by a varicose condition of the veins of the broad ligament situated near the ovary, which in these cases is due to parametritis. If the inflammation of the mucosa interferes with or destroys the action of the ciliated epithelium an ovum cannot enter the tube and sterility follows. There may exist, then, cases of salpingitis without pain so long as there is no peritoneal or ovarian involvement. *These are the cases which may go on to recovery and in which subsequent pregnancy may take place.* At the same time these are the very cases in which ectopic gestation may occur.

Abel, in his "Gynecological Pathology," attributes to affections of the mucous membrane the etiology of many cases of ectopic gestation.

My own views as to the causation are as follows: I believe that in the so-called sterile period, gonorrheal, puerperal, tubercular, and atrophic changes take place. The interval of years between the last labor and the ectopic gestation, the fact that the location is generally in the mid-portion of the tube, the occurrence of an ectopic gestation on both sides at the same time, and the frequency of external migration, together with the combination of extrauterine and intrauterine gestation, point certainly to an affection of one tube, and to involvement of lesser or greater degree of the other tube. The frequency with which, according to Küstner, a hemorrhagic tendency of the non-pregnant side occurs, as well as the microscopic discovery of catarrhal conditions, together with the history and the microscopic evidences of the presence of gonococci, point distinctly to a tubal affection. The observation of Dührssen, who found cilia abdominal to the placental site and none median to it, and Veit's observation of the presence of inflammation median to the ovum, as well as the theory of congenital and acquired atrophy of the tube, especially subsequent to labor, lead us at the present day to seek in the microscopic changes of the tubal mucosa, *i. e.*, injury to the cilia, the etiologic factor in tubal gestation. Subsequent observation has still further confirmed this opinion.

The purpose of quoting these observations on ectopic gestation is this: There is certainly some obstruction in the tube which prevents the ovum from entering the uterus. This obstruction is either an inactivity on the part of the ciliated epithelium as a result of inflammation, or else edema and adhesions of the tubal mucosa. The ovum is arrested in its progress toward the uterus. Such a tube, whether in an early stage of inflammation and slightly involved, or in a late stage and nearly healed, must certainly be fairly normal in its outer end to permit the ovum to be taken up into the tube at all, and yet, to the eye at least, these tubes do not appear markedly affected. As further proof, we find, in many of these cases,

the other tube affected to an extent which warrants its removal. In my hands, ten non-pregnant closed tubes were also removed at operation (28 per cent.). This simply represents the same variation in the degree of severity of the affection of the two tubes as is observed in most cases of salpingitis and even of pyosalpinx.

Most cases occur in multiparæ, yet a certain proportion do occur in nulliparæ. I consider uterine or ectopic gestation, after long periods of non-artificial sterility and after conservative operations for inflammatory conditions, in most cases an evidence that restoration to the normal has taken place in the tubes in whole or in part. I consider ectopic gestation as an evidence that either a tube is beginning to be affected at the uterine end or that it is almost restored to the normal at the abdominal end.

HYDROSALPINX

Hydrosalpinx is a cystic, elongated tumefaction of a Fallopian tube situated lateral or postero-lateral to the uterus, and which on bimanual examination seems gradually smaller as the uterine horn is approached. Adhesions of various parts of an inflamed tube with each other have been formed, with twistings and turnings of the tubal canal in long-continued cases. As a result of the primary catarrhal inflammation there is a firm closing of the abdominal opening, because the swelling pushes the fimbriæ close to each other, causing finally a mutual adhesion. Then begins the chronic stage, for the tube, closed at both ends, affords no outlet to the secretion resulting from the inflammation, which may constantly collect in the tube, and the tube may distend to very large size. First the mucous membrane and then the muscle becomes atrophic from the pressure of the increasing fluid, and it is on account of the presence of numerous elastic fibers in the tubal wall that such swellings can exist for a certain period without rupturing. At times it happens that such tubal tumors filled with serous fluid, when they reach a decided size, empty through the uterus, only to fill again in a short time. Landau, following the etiology of the conditions observed in the kidneys, has named this condi-

tion intermittent hydrosalpinx. The fact that the contents are always serous is characteristic of this process, but rupture of vessels occasionally occurs and the serous contents are mixed with blood. Another characteristic of hydrosalpinx is that in a short time the entire tube may become affected, so that there is a large cyst, which may be fully emptied by puncture or incision at one point. Hydrosalpinx is usually one-sided, but bilateral affections are not uncommon.

TUBO-OVARIAN CYSTS

When the ovary is involved with a hydrosalpinx and the two are united by adhesions, there not infrequently occurs a communication between the tubal tumor and one or more cystic spaces in the ovary. This is the so-called tubo-ovarian cyst. In other cases there is no communication between the tube and the ovary, but the ovary is very much enlarged and consists of one or more large spaces resulting from inflammation of the follicles. Such tubo-ovarian cysts are situated either posterior to the broad ligament or on the floor of the pelvis or far over to the lateral wall of the pelvis, or they may extend upward into the abdominal cavity. They have a more or less tense cystic feel and the diagnosis can be made if the dilated tube can be traced up to the uterine horn. However, when situated posterior to the broad ligament its connection with the latter is often so intimate as to simulate an intraligamentous cyst. A differential diagnosis from ovarian cyst bound down by adhesions is often very difficult. The mobility of these tumors depends on their adhesions. When fixed to the floor of the pelvis they are not very movable. At times, however, especially when attached mainly to the sigmoid, they may be pushed up into the abdominal cavity as far as the mobility of the sigmoid will permit.

PYOSALPINX

Etiology.—It is not so long since the vast majority of cases of pyosalpinx were attributed to sepsis (streptococci or staphylococci) after labor or after abortion or curetting. Though pyosalpinx certainly may be caused by other bacteria, and though at least 2 per cent. of the cases are due to the bacillus tuber-

culosis, it is now quite generally recognized that the majority of these cases are due to gonorrheal infection, and yet, in innumerable instances, the gonococci cannot be found. They die soon, are destroyed by their own toxins, especially if in association with other bacteria. The gonococci in pyosalpinx either lose their virulence or disappear after a certain period of time. Yet they have been found in the tube wall when not present in the purulent accumulation. In puerperal cases gonococci are often found in the lochia, when not found previously, and rapidly disappear, so far as examination by the microscope is concerned. The fact that they cannot be found is no proof of their absence.

In one hundred and seventy-nine cases of puerperal endometritis Krönig found gonococci in the lochia of fifty. According to Krönig, examination of puerperal endometritis shows the relative proportions of the various infecting bacteria to be 2 per cent. staphylococci, 27 per cent. saprophytes, 27 per cent. gonococci, and 43 per cent. streptococci. Most of the fatal cases are due to streptococci. The sequelæ, then, of puerperal inflammations can be easily understood.

When gonorrhea, originally acute, exists in nulliparæ, and persists until and during pregnancy, it is then that abortion, labor, or curettage may produce a recrudescence which is acute in all of its manifestations, and develop purulent accumulations in the tubes, peritoneum, or pelvic connective tissue. On the other hand these local acute conditions may be cured to all intents and purposes, and months or years afterward an extension upward may take place, which extension is not necessarily acute in its character. The bacteria may have lost their virulence, the patient's tissues have grown somewhat accustomed to the cocci, have become more or less immune, and any new involvement may be of the character and nature of a subacute inflammation. Even in puerperal women free of fever a certain, though small, percentage show in the lochia, streptococci, staphylococci, gonococci, and bacteria.

Histopathology.—There is a greater tendency for purulent inflammation to become chronic than to resolve completely. Marked anatomic changes are found in cases which have come

to operation after existing many years. The cause of a purulent inflammation is exclusively bacterial infection. The septic and gonorrheal forms are the most frequent. In comparison with these, infections due to other bacteria are relatively rare; among them may be considered the pneumococcus (Fränkel) and the bacterium coli. Septic inflammations are mostly puerperal, yet they may occur through infection during operations upon the uterus, or through propagation of a bacterial affection of the abdominal cavity, such as perityphlitis, etc. At times in gonorrheal affections a mixed infection may occur. The formation of pus occurs early, so that the tubal contents consist of purulent secretion. On account of the numerous cells which this pus contains it is usually found to be a thick, tenacious, and sometimes cheesy substance. In acute cases it is possible to distinguish the two main forms of inflammation by finding either gonococci or streptococci.

In purulent inflammation there is a marked infiltration of the mucous membrane with round cells and coëxisting hyperemia of the vessels. The folds swell and become adherent or are united by the pus found between them. The cilia of the epithelia disappear, but in spite of long-continued suppuration, the epithelium of the tubal lining is usually preserved, even on the surface, which is certainly in contact with the pus, and there are only here and there certain areas denuded of epithelium (Carl Abel).

When an acute inflammation becomes chronic the adhesions and unions of the folds become constantly firmer and furnish remarkable pictures, for sections of epithelial spaces result which look like glands. These pictures are naturally the more complicated and the more difficult to interpret, the larger the number of folds originally present, especially in the ampullar end.

In careful examination of such a specimen it may be found that the gland-like formations are always on the surface of the mucous membrane and never penetrate into the muscularis.

Chronic purulent inflammations cause entirely different conditions from the catarrhal form, for in the latter a large tube sac may be formed after a time in which the entire tube is uniformly

affected; in the former this is not the rule. In purulent inflammation the tube is divided into different abscess cavities by adhesions of the various parts, so that in longitudinal section through the whole tube there appear several cavities of different sizes completely separated from each other.

This is the reason why such a chronic purulent salpingitis cannot be relieved by simple puncture or incision. It could only be accomplished if a single tube abscess were present, which occurs only occasionally.

The stroma of the mucous membrane consists partly of round cells and partly of granulation tissue, and the vessels are increased in number. In the narrow spaces between the folds pus is seen, which consists of closely gathered round cells, bacteria, and often also red blood-cells. This is, therefore, a productive inflammation.

With the exception of cilia, the epithelium remains intact in the chronic form for an astonishingly long time, and in the deeper folds even the cilia are not infrequently preserved. At times cases are observed in which large areas of the surface are denuded of their epithelium, for which process it is hard to find a plausible reason.

This happens either through mechanical pressure exerted by the accumulation of pus or through direct purulent degeneration of the tissue.

The tubal wall in chronic inflammation is almost always affected. In most cases there is hypertrophy of the wall, and the round-celled infiltration fills the interstices of the muscularis. There are also large circumscribed groups of round cells which resemble lymphomata. The vessels, even up to the peritoneum, are often seen in sections surrounded by a thick circle of round cells.

The folds may disappear, and through purulent destruction of the wall the latter becomes decidedly thinned, and perhaps before this the existing septa between the individual sections of the tube are destroyed and there results a genuine tubal abscess after the abdominal and uterine ostia are closed.

The second result of a chronic inflammation is the formation of new connective tissue. In such a case the wall always

becomes thicker and shows a firm consistence as the result of the connective tissue hyperplasia. The folds become atrophic, the mucous membrane has a stroma of firm connective tissue, the epithelium may disappear, and there may even result the firm closure of the tubal canal. Such a tube, even if thicker than a thumb, if no new injuries through adhesion with the abdominal organs take place, may cause the patient no annoyance (Abel).

Ovarian Abscess.—If after chronic purulent salpingitis a tubal abscess results, the pus may break through into the ovary and cause a coëxisting ovarian abscess. Even though no complete abscess is present, but only isolated pus formations in the various parts of the tube, the union of both organs may lead to the penetration of pus into the ovary and the formation of an abscess. Gradually then one large abscess develops. It may happen that the tube goes directly into a corpus luteum and then a córpus luteum abscess may be formed.

Symptoms.—Acute pyosalpingitis is either tuberculous, septic or gonorrheal. It is a condition which is not limited to the tube alone, but through the discharge of the inflammatory products into the peritoneum is associated with various degrees of peritonitis characterized by pain, sensitiveness, tenderness, abdominal distension, leucocytosis, and elevation of temperature. Associated with this pyosalpingitis and peritonitis there may be involvement of the pelvic connective tissue, which is usually noted in the post-partum septic form. The gonorrheal form merges into a subacute stage much more rapidly than the septic form.

In chronic pyosalpinx there is involvement of the peritoneum with adhesions to various pelvic organs. There may be anomalies of menstruation. Menstruation occurs prematurely, is profuse, and is associated with pain. These changes are due to the involvement of the uterine lining, to involvement of the uterine wall, and to involvement of the vessels about the uterus. The pain is due to adhesions and is increased at menstruation. Acquired dysmenorrhea is a most important characteristic of such inflammations and is due to the changes occurring in the uterine lining and wall and in the ovaries.

Diagnosis.—The diagnosis is made by bimanual examination. In those cases which are distinctly chronic and are free from pain, the determination of the patency of the tubes by the transuterine insufflation of oxygen or carbon dioxid gas (Rubin test) is of immense value. The normal tube can be felt only in patients with thin abdominal walls. The milder degrees of salpingitis can be detected with difficulty. In the milder degrees of salpingitis the ovary can be identified and is often more or less fixed by slight adhesions. If fixed to the lateral pelvic wall, it often escapes detection by the examining fingers. The more infiltrated and thickened tubes, up to the varying degrees of large pyosalpinx, can be made out more readily. In pyosalpinx and tubo-ovarian tumors the ovary, as a rule, cannot be distinguished from the tube. Adhesion of the tube and ovary to the posterior wall of the broad ligament is usual. Examination generally shows tube and ovary in pyosalpinx postero-lateral to the uterus, but they are often adherent in the cul-de-sac of Douglas. Tubo-ovarian cysts are generally situated posterior to the broad ligament, but more lateral than pyosalpinx. Tubo-ovarian cysts are often situated far over to the lateral wall of the pelvis. When on the left side, adhesions to the sigmoid may be dense.

Pyosalpinx must be differentiated from ectopic gestation. In the latter at least one menstrual period has been passed; there is irregular spotting or bleeding, there is often severe colicky pain. The uterus is generally, but not always, enlarged and is somewhat softer; there is pulsation in the uterine arteries. These conditions, however, may be present with involvement of the tubes, especially in the early stages. Gonococci and evidences of gonorrhea should then be looked for.

In early salpingitis the uterus may be enlarged, through inflammation, there may be irregularities of menstruation, there is usually pulsation in the uterine vessels and a sausage-shaped tumor is felt, all of which renders the differential diagnosis from ectopic gestation difficult. Salpingitis is frequently double-sided and there is a leukocytosis. Pyrexia is present with acute salpingitis, but this is often noted with ectopic gestation associated with internal bleeding and absorption of

the fibrin elements of the blood. Rectal examination is of great aid in determining the outline and character of the tube. As a rule, however, a pregnant tube is the softer. Gonococci and evidences of vulvar and cervical gonorrhea should be looked for.

In distinguishing pyosalpinx from a small myoma the history is of greatest importance. Either a history of post-partum infection is present or else corroborative evidences of a gonorrheal infection are to be looked for.

Differential diagnosis sometimes has to be made between pyosalpinx and hematocele. It must be stated that in the latter the tube and ovary, as a rule, are situated in front and to the side of the mass, which fills up the cul-de-sac of Douglas.

TUBERCULAR SALPINGITIS

Tuberculosis of the tubes is not uncommon. It is usually secondary to the presence of the bacilli in the peritoneal cavity, which are taken up by the ciliated epithelium of the tubes, and, therefore, affect the tubal mucosa. Many cases present the picture of catarrhal salpingitis and the diagnosis is only established by examination of sections. It is probably often present in either early or advanced cases of tubal involvement, even when macroscopic examination shows no alteration of tuberculous nature. A change considered typical of tuberculosis is a small or multiple nodular thickening of the tube, the so-called salpingitis isthmica nodosa. The tube is firm and hard. In more advanced cases the tube ends are closed by adhesions and the tube is enlarged and contains a creamy purulent or cheesy material and tubercles. In still more advanced cases the tube gives the picture of a pyosalpinx. There are often in the major forms, involvements of the peritoneum and ovaries with adhesions and ovarian abscess. When the tubes and uterus are studded with miliary tubercles or when a tuberculous peritonitis is present, the diagnosis is easily made at operation.

On bimanual examination the condition found is either that of salpingitis or of pyosalpinx. When tuberculous peritonitis exists with ascites, and evening temperature and tuberculosis of

the lungs are noted, a tentative diagnosis may be made. In cases without pyrexia the injection of tuberculin with a resulting temperature reaction speaks for the specific tubercular nature of the tubal involvement, although this reaction may be caused by a tubercular focus elsewhere.

Treatment.—Unless a rapidly growing thin-walled pus sac or an ovarian abscess or a purulent exudate in the sac of Douglas renders vaginal incision and drainage necessary, the acute cases are treated conservatively. The patient is confined to bed, and the diet restricted to liquids and semi-solids. Elimination is encouraged. The bowels are kept open by daily doses of effervescing sodium phosphate, the kidneys stimulated by the liberal ingestion of water, and the skin kept active by daily alcohol sponges. Three hundred cubic centimeters of 2 per cent. bicarbonate of soda and 5 per cent. glucose solution are given as a Murphy drip once a day. An ice bag is applied to the lower abdomen, and a hot normal saline douche is prescribed three times a day. After the acute stage, if pyosalpinx results, treatment for several months, but without intrauterine manipulations, as given under Chronic Metritis (pp. 723, 724, 725), should be carried out. Then the bacteria or cocci in the tubes either disappear or lose their virulence and operation, if necessary because of pain, is not dangerous. Post-operative stump-exudates (recrudescences of the associated cellulitis of the broad ligaments) are thus avoided. Tuberculous pyosalpinx, contrary to usual opinion, injures the general health of the patients the least of all tuberculous involvements (Geo. Gray Ward). After operation they improve remarkably. If hydrosalpinx or tubo-ovarian cysts cause pain, operation is indicated. The mild forms of salpingitis and the cases of salpingitis diagnosed by exclusion as the cause of sterility and salpingitis of the non-pregnant tube in ectopic gestation demand the treatment given under Chronic Metritis (pp. 723, 724, 725), but without any intrauterine manipulation of any sort. With such cases, and with cases in which operation is performed to remove the adnexa of one side only, *curettage should never be done.* It makes the unrecognized salpingitis of the other side worse, or starts it up if not present, it sends infection out into the broad liga-

ments, causes varicocele of the broad ligaments and ovarian dysmenorrhea. It does this with a minimum of early annoyance, but with a maximum of eventual harm. After operation on the adnexa of one side, the patient should stay in bed for four weeks to diminish the tendency to extension to the other side.

Laparotomy should never be done while the infection is active. Under palliative and medical treatment the acute process invariably subsides, and the symptoms lessen, at least to a certain extent. The sole exception to this rule is a virulent streptococcic infection, with a streptococcemia. Although most of these patients die, irrespective of any form of treatment, some gynecologists seem to feel that removal of the tubal foci may give the patient a chance for her life.

ECTOPIC GESTATION

Etiology.—In former years our views concerning the origin of ectopic gestation depended mainly on the discovery of pathologic conditions macroscopically evident. Cases were reported with fibroma of the isthmus tubæ or with polyps at the uterine end of the tube. The growth of the ovum in a tubal diverticulum or in an accessory tube was considered to furnish a satisfactory explanation. In some cases the pressure of ovarian or abdominal tumors was supposed to obstruct the onward movement of the ovum. Abel and Freund found in a twisting of the tube and in a failure of development a satisfactory theory for the frequent occurrence of ectopic gestation. Since, in a majority of the cases, peritoneal adhesions are present, these were and still are considered to so alter the course of the tube's lumen as to prevent the entrance of the ovum into the uterus. Therefore, definite inflammations were considered to be an important etiologic element.

The experiments of Leopold have shown that the ovum given off by one ovary may enter the tube of the other side. The cases are not rare in which the tube of one side was closed or absent, and although the corpus luteum verum was found in the ovary of the same side, yet an ovum had entered the uterus. Schröder, Koblanck, and others have found a pregnancy in a rudimentary horn between which and the uterus no epithelial connection existed. Many years ago Manierre collected thirty-nine cases of pregnancy in rudimentary horns. The same is true of those cases in which the corpus luteum verum is on one side and the ovum has developed in the horn of a uterus unicornis of the opposite side. Küstner removed a right-sided extrauterine gestation tube and a left-sided ovarian cyst. Shortly afterward a uterine pregnancy took place.

Such an *external migration* occurs frequently in tubal gestation; although Küstner noted the frequency of this event in only the last twenty-five of a series of one hundred cases, it proved to

have taken place in seven. Prochownik found that external migration had taken place in one case of eight which he had examined closely. Martin found the corpus luteum on the same side as the tubal gestation in thirty-seven cases, on the opposite side in four, and uncertain in thirty-six.

External migration of the ovum has been viewed by Sippel and others as the etiologic factor in ectopic gestation. They believe that the ovum after its migration becomes too large to permit of its passage through the tube lumen. The examinations of Peters, and especially of v. Spee, however, show conclusively that no chorionic villi are present until the ovum has been nourished for a considerable time by the decidua in which it is embedded. In addition, the Graafian follicle is in the majority of instances found in the ovary of the affected side, so that such an etiology would explain only the smaller number of cases.

This migration, however, calls attention to the presence of a pathologic condition in the mucous membrane of the opposite non-pregnant tube. While it points to the fact that the non-pregnant tube is often affected, it only proves that it is more affected than the tube in which the ovum is finally embedded, for some cilia must be present in the latter to influence the external migration of the ovum. Various experiments make it seem probable that in the perfectly normal tube no ovum can develop.

In considering the history of those cases which have been closely observed it is found that ectopic gestation occurs most frequently in multiparæ and that a period of sterility precedes this pathologic development. Martin found that sixty-five multiparæ were affected as compared with twenty nulliparæ. In a series of one hundred cases of Küstner's only ten ectopic gestations occurred in nulliparæ; the other eighty-seven had borne children and three had aborted. In twenty-four cases it occurred five or more years after the last labor; in fifty-five cases, from one to five years; and in eight, in less than twelve months. Veit found that in fifty-two cases of repeated ectopic gestation a sterile period of two to eleven years preceded the first ectopic gestation. Between the two events was a period of six weeks to six years. The primary

sterile period represents the time in which inflammatory changes in the mucosa may occur, either *gonorrheal*, septic, or tuberculous. These changes naturally involve the uterine end of the tube more than the abdominal, and in the subsequent course of events, when healing does result the uterine end improves slowly.

Franz believes inflammatory changes in the tubes responsible for the occurrence of ectopic gestation. This is the more probable since inflammatory processes are so frequently found in the other tube. Franz found such changes in 80 per cent. of those cases in which a sterile period of two to seventeen years was noted. In cases where a sterile period of less than two years was observed, tubal changes of the other side were present in only 53 per cent. He comes to the conclusion that we must seek the etiology in those affections of the tubes which have run their course, and which, having for a long time prevented the moving of the ovum, have permitted a gradual and partial restoration to normal conditions.

While in a certain number of cases no pathologic microscopic changes are found in the tubal mucosa, it may be explained by the fact that so-called catarrhal conditions frequently show little microscopic change. Even during or after gonorrhea the tube may seem, macroscopically, fairly normal. Ahlfeld, in an experience of many years at the University of Marburg, met with so few cases of tubal gestation that he considers the relative freedom of his patients from gonorrhea, as compared with those in the larger cities, to be the only explanation.

Various inflammatory influences are etiologic factors in that they destroy the cilia in whole or in part, or diminish their functional activity.

Naturally, there must be activity to a certain extent on the part of the cilia at the abdominal end of the tubes, or the ovum would not be drawn into the tube at all. The fecundated ovum is drawn up into the tube, is carried along to a point where the cilia no longer functionate, stops there and an ectopic gestation begins.

Recurrences of tubal gestation take place but rarely in the same tube. Patellani, in a tabulation of thirty-six cases, found

that first one tube and then the other was the seat of ectopic development. Veit, among fifty-two reported cases, found that it recurred only three times on the same side. An additional point of importance is the occurrence of tubal gestation in either tube at the same time, of which Gebhard mentions nine cases. Further, Patellani has collected thirty-seven instances of combined uterine and extrauterine gestation—a practical proof of an affection of one tube, and certainly excluding external migration as the cause.

I believe that in the so-called sterile period gonorrheal, puerperal, or tuberculous changes take place. The interval of years between the last labor and the ectopic gestation, the fact that the location is generally in the middle area of the tube, the fact that repeated ectopic gestations are observed, the occurrence of an ectopic gestation on both sides at the same time, and the frequency of external migration, together with the combination of extrauterine and intrauterine gestation, point certainly to an affection of one tube, and an affection of a different degree of the other tube. The frequency with which marked inflammation of the non-pregnant tube is noted, as well as the microscopic discovery of catarrhal conditions, together with the history and the microscopic evidences of the presence of gonococci in many cases, point distinctly to a tubal affection. The observation of Dührssen, who found cilia abdominal to the placental site and none median to it, and Veit's observation of the presence of inflammation median to the ovum, lead us at the present day to seek in the microscopic changes of the tubal mucosa, *i. e.*, injury to the cilia, the etiologic factor in tubal gestation.

The tendency is increasing to consider inflammatory changes as the cause of ectopic gestation. Some, however, contend that the ovum has in some instances a well developed outer cell growth when it enters the tube, and that this causes its settling in the tube. Others consider a perisalpingitis subsequent to appendicitis as the responsible factor. Many claim that the cause is not known.

Philander Harris agrees with my view. "All who are experienced in suprapubic sections for pelvic disease will

surely agree in the assertion that a very considerable percentage of women who have tubal pregnancy are found, when operated on, to have diseased tubes. Thus it must be apparent that in a certain percentage of the cases of ectopic gestation there are two symptom producing factors, namely, salpingitis and pregnancy within a tube. Not very gross pathologic changes, coming from salpingitis, constitute the chief if not the only cause of ectopic gestation."

"It is the existence of salpingitis, the great sterilizing disease of women, which accounts for the fact that periods of sterility, varying from three to fifteen years or more, so commonly precede the occurrence of tubal gestation. A previous attack of salpingitis not only causes the sterility, but also renders the tube incapable of conveying the fecundated ovum to the uterus."

Histopathology.—The lining of the tube is composed of folds of mucosa. An ovum may begin its development situated on the surface of the mucosa folds, forming the *columnar* type of tubal gestation. Or it may begin its development down deep among the folds of mucosa, forming the *intercolumnar* type. An ovum may settle on the tubal wall and sink deeply into the wall of the tube. Its chief placental growth at this point results in penetration of the wall by villi. This is the *centrifugal* type of development.

In the *columnar type of development* the ovum is surrounded by mucosa folds only. Such a columnar situation makes abortion easy and of little danger. Very soon after the entrance of the ovum tubal bleeding may result; the ovum dies and further hemorrhage expels it. The tube may return to a normal state, without any evidences of the previous condition, or else a hematosalpinx may be formed if the abdominal end of the tube is closed. The ovum may, theoretically, develop to a much further degree and press the folds against the tubal wall. If development continues, the villi may extend into it, but the connection of the ovum and the villi with the surrounding tissue is a loose one.

In the *intercolumnar* form the ovum may rest on the wall of the tube. Any tubal fold beneath it will be compressed, but epithelium may be present in a depression. Other folds may

form a capsularis or reflexa. The villi at the placental site enter into the wall; here a hemorrhage may result through this invasion of the wall and of the vessels, and through the invasion of the capsularis by fetal cells; or the capsularis may rupture. If it be torn, or if it be not closely adherent, the intervillous space is opened. Abortion, complete or incomplete, usually incomplete, is the general rule, but rupture may occur. If the abdominal end be closed, a hematosalpinx or a tubal mole may represent the final outcome.

In the *centrifugal* form the ovum sinks into the wall of the tube and an invasion of the wall and vessels by the villi may take place, even up to the serosa. The capsularis is formed by muscularis and mucosa. It may rupture at its summit. The villi which extend up to the serosa may cause bleeding, though their penetration is so gradual that these points are usually covered by thrombi. Finally a rupture may take place at the placental site through perforations, producing an arrosion. The ovum practically eats up the wall. Even though the tubal diameter be large enough to give sufficient room, this occurs. It is not the result of pressure, as may be seen in gestation at the fimbriated end, where rupture also can result. Villi which perforate the serosa may cause a very decided hemorrhage into the peritoneal cavity. When no rupture has occurred and the abdominal end of the tube is closed, only the microscope may divulge the source of such an intraperitoneal bleeding. Such minute perforations may cause collapse through hemorrhage, even though the opening be no larger than the head of a pin. Even after the death of the ovum the villi can grow, and an active tubal mole is found with continued bleeding. If villi do not grow, hemorrhage continues, since no contraction can take place as is the case in the uterus. The centrifugal form furnishes the majority of tubal ruptures. But most of these so-called tubal ruptures are either arrosions or are due to arrosion by the perforating villi.

The Further Course of Ectopic Gestation.—The theory that the tube ruptures because the ovum is too big is, as a rule, erroneous for cases in the first three months. The various interruptions of ectopic gestation are all the result of hemor-

rhages, primarily minute. The usual ending, clinically, of the gestation begins with bleeding in the tube. The invasion of the vessels of the mucosa and the tube wall and the invasion of the serosa furnish the causes for hemorrhages. The death of the fetus, as in the case of the uterus, brings about changes which result in bleeding. The primary cause is a lack of decidua. In a mucosa previously affected, when many large vessels are changed by the fetal cells and invaded by villi, an increase in tension through contractions of the tube walls furnishes an easy explanation of this hemorrhage. In the uterus the vessels are firmly embedded in the thick decidua and take a twisted course; in the tube the vessels are straight and embedded in loose connective or fetal tissue. Bleeding on the part of the capsule is possible and is of frequent occurrence, since it does not undergo decidual change and may be invaded by fetal cells. The contraction of the muscle fibers on either side of the capsularis renders the rupture of this pseudo-reflexa easy because of the absence of decidual changes, and the point of rupture is usually at the summit of the capsularis. If the capsularis or reflexa be composed of muscularis and mucosa, a decided bleeding may result if only the summit of the capsularis be torn.

Rupture of the tube almost always takes place at the placental site, which is the seat of old and new hemorrhages. The hemorrhage and loosening of the ovum which represent the clinical ending of these cases is not the first bleeding, for older ones are usually present. The various processes depend upon the ovum, the condition of the tube before pregnancy, the character of the union of the ovum with the tube, the place of union, and trauma. The reaction of the tube is limited to the area of the ovum; and this constitutes the main difference between tubal and uterine gestation. The uterus undergoes early independent growth; the tube does not. With the development of the ovum the uterus grows step by step, while in the tube the ovum makes room for itself and obtains its nourishment by the invasion of the tube walls. It may stretch the circumference of the tube so that its wall may be reduced to a layer of connective tissue, so thin that rupture may result at any point.

Ampullar cases usually end in abortion, generally with hematocele. There is no obstruction, unless decided adhesions are present, and the blood is generally poured out quickly into the pelvic peritoneum or into the sac of Douglas. Such an abortion may be complete or incomplete. Rupture occurs in this situation very rarely. The majority of tubal gestations are situated nearer the isthmus tubæ. In these cases there may be: (1) Abortion without rupture, complete or incomplete, with bleeding from the abdominal end of the tube. Generally a hematocele is found at the abdominal end. The tubes are often so tortuous that it is difficult for the blood to make its way to the fimbriæ, and the oozing is very gradual. The blood extends rarely more than a very short distance toward the uterine end, because of the numerous short curves present here. (2) Single or multiple microscopic perforation of the tube wall by villi, causing even decided hemorrhage without apparent cause. (3) Macroscopic perforations or "arrosions" of the tube wall, covered or not covered by thrombi, and causing profuse hemorrhage. (4) A rupture either into the free abdominal cavity with no hematocele at the abdominal end of the tube, or with partial encapsulation, in which event there may be hematocele at the abdominal end if the tube is open. (5) An intraligamentous tear with hematocele at the abdominal end. In these latter cases the placental site is always on the inferior surface of the tube and the ovum has descended centrifugally to the vessels of the ligamentum latum. These and the interstitial forms are the most difficult cases, and may require hysterectomy to remove the mass in toto.

There is grave danger from continued bleedings caused by tubal abortion. The general view is that tubal rupture gives much more pronounced symptoms and a much more decided hemorrhage than tubal abortion. Considering that incomplete abortion means that villi are left in the tubal wall, and that so-called complete tubal abortion implies the retention of trophoblast cells, it is evident that bleeding may continue for an indefinitely long period. It is a fact, too, that even complete abortion may cause decided symptoms. Mandl reports two cases from the clinic of Schauta, accompanied by pronounced

collapse and decided hemorrhage. In the first case no villi were found in the tube wall. In the second case, although villi were found in the blood-clot in the tube, none were found in the tube wall. Like cases of tubal abortion, with symptoms as severe as are frequently the rule with tubal rupture, have been reported by Klein, Zedel, Piering, and others. It is apparent that pathologic and clinical evidences are of sufficient weight to controvert the view, prevailing in many minds, that tubal rupture should be treated by extirpation of the tube, and that tubal abortion demands only conservative treatment. The proportion of tubal abortion to tubal rupture is probably 8 to 1. In this connection it is quite sufficient to mention the dangers arising from hematocele. The injury to the peritoneum, the adhesions which take place, and, above all, the by no means infrequent occurrences of subsequent purulent degeneration of such an accumulation of blood, are only some of the injurious results avoided by prompt removal.

The possibilities are represented by the processes of abortion, microscopic perforation, macroscopic perforation, rupture, hematosalpinx, and tubal mole. In ninety-nine cases of interrupted tubal gestation in the clinic of Schauta, a hematocele was found sixty times—fifty-five after abortion, five times after rupture. If the bleeding be very slow, the blood forms a capsule, due to peritoneal adhesions, into which the subsequent hemorrhages enter, the so-called secondary hematocele. If adhesions are present at the abdominal end of the tube, they form a portion of the capsule. The hematocele resulting after rapid bleeding furnishes the primary or diffuse form. The secondary hematocele occurs much more frequently than the primary. In the sixty hematoceles found among ninety-nine cases in the clinic of Schauta, only four were diffuse. Of the tubal abortions found in the same clinic, seventy-five were incomplete and six were complete.

Symptoms.—In ectopic gestation the breasts rarely show the same evidences of pregnancy as in intrauterine gestation. There may be pulsation of the uterine arteries, but this is also present in intrauterine pregnancy and in other conditions, especially inflammatory. The passing of a decidua accompanied

by bleeding occurs with tubal hemorrhage, tubal abortion, or tubal rupture, but here intrauterine abortion and dysmenorrhea membranacea must be excluded. It is always most important to ask about the occurrence, non-occurrence, or character of the last expected or skipped menstruation. There may have been relative amenorrhea or absolute amenorrhea, which latter is generally the case even if it lasts only for ten days or two weeks. Sometimes no change in menstruation has been observed. Uterine bleedings generally suggest disturbances in the tube, such as death of the embryo, hemorrhage, tubal abortion, or tubal rupture. These bleedings are usually followed by peritoneal irritation and by tubal and uterine colic. These sudden pains are not always felt in the pelvis, but sometimes higher up, even in the region of the liver. Combined with these symptoms there is often nausea, pallor, dizziness, or fainting. The uterine bleeding may continue irregularly for days or weeks, often with the above colicky pains, but the bleeding is not extremely profuse, clots are rarely expelled, and the blood is often brown and mixed with mucus.

In contradistinction to intrauterine abortion it is noted that the cervix is not dilated. Examination of expelled structures shows no embryo, no fetal membranes, no chorionic villi. When decidua is expelled, microscopic examination may aid in the diagnosis. The decidua cells in ectopic gestation are not so large as in intrauterine pregnancy. The cells are not flattened and no chorionic villi are found. The microscope can make a positive distinction in favor of uterine pregnancy only by the finding of chorionic villi.

Ectopic gestation may be diagnosed before bleeding, abortion, or rupture take place in the tube, or after one of these has occurred. In the first instance bimanual examination finds a round or sausage-shaped dilatation of the tube which is soft, elastic and sensitive, and not so tense as ovarian tumors. This mass is movable unless adhesions are present. It resembles adnexal tumors, and a differential diagnosis is especially difficult from an intrauterine gestation combined with an adnexal tumor.

In the second instance bleeding may take place into the tube, which then feels firm, hard, and movable; or into the cul-de-sac of Douglas; or if the bleeding occurs slowly and the blood coagulates, it may accumulate about the tube. Bleeding in the tube or tubal abortion or tubal rupture produce peritoneal irritation. There is then a history of amenorrhea and of irregular menstruation or of irregular spotting or oozing The decidua, if expelled, is generally cast off after tubal abortion or rupture has taken place. Examination may show a soft resistance in the cul-de-sac of Douglas if there is free bleeding, or increased resistance about the adnexa if the bleeding is slow and encapsulated.

Cullen has called attention to the dark (usually bluish) appearance of the umbilicus, in those cases in which rupture has occurred and there is free blood in the peritoneal cavity. While this sign is not pathognomonic of intra-abdominal hemorrhage, or ectopic pregnancy, the discovery of this condition, together with the clinical history and pelvic objective findings, may establish the diagnosis.

If blood is accumulated in the cul-de-sac of Douglas, such a fresh hematocele is soft and cystic, but later on becomes hard. It is to be diagnosed from a retroflexion of the gravid uterus. A hematocele pushes the uterus forward. As Winter says, the whole of the uterus is in front of the tumor, whereas in retroflexion of a gravid uterus only the cervix is in front. In retroflexion of the gravid uterus the connection between the cervix and the soft, pregnant, retroflexed fundus in the cul-de-sac of Douglas is not made out, and the cervix is mistaken for the uterus and the retroflexed fundus is mistaken for a hematocele.

A *peritubal hematocele* is generally situated postero-lateral to the uterus, is of irregular outline, soft in the earlier stages, and later on harder and firm and may be so large as to extend above the umbilicus.

Intraligamentous hematocele has probably no other cause than the rupture into the broad ligament of a tubal pregnancy. With marked bleeding into the peritoneal cavity of a rapid nature the symptoms are those of internal hemorrhage and constitute the tragic form of this condition.

The Early Diagnosis of Ectopic Gestation.—Because of our complete accord on this important topic, I quote in the remainder of this section the views of Philander Harris: "There are instances in which the first complaint of the patient, and the first symptoms, are of such nature as to excite the greatest alarm in the minds of physician and friends of the patient, because the patient is, without previous warning, brought at once to the verge of death; yet such cases are very exceptional. Such symptoms occurring progressively or suddenly are called the tragic symptoms of ectopic gestation.

"Twenty-nine out of every thirty cases of ectopic gestation present symptoms by which a presumptive, if not a reasonably certain, diagnosis may be made prior to the patient's arrival at a condition which is alarming. Most cases present a group of symptoms preceding the tragic stage of the disease sufficiently distinctive to warrant a diagnosis, and since these symptoms are in no way alarming, they are called the non-tragic symptoms of ectopic gestation." Based on an experience of over one hundred cases, Harris came to the following conclusions:

(*a*) More than 90 per cent. consulted a physician on account of symptoms referable to the pelvis before the tragic stage was reached.

(*b*) Many of them received medical advice or attendance for a term of several weeks before tragic symptoms presented.

(*c*) Many such cases are not diagnosed, and although the patients continue to exemplify the symptoms of the non-tragic stage of ectopic gestation, they rely for days or weeks upon false hopes until the tragic symptoms occur.

(*d*) Of the 90 per cent. who consulted a physician a very large proportion were told that an (ordinary) abortion was threatened, was recurring, or had occurred.

(*e*) Of the 90 per cent. who consulted a physician, about 20 per cent. were subjected to the operation of curettment for the cure of metrorrhagia, the real cause of the metrorrhagia not having been suspected.

(*f*) Of the 90 per cent. who consulted a physician, some were unable to pursue their usual vocation, being confined to the bed or couch for days or even weeks before tragic symptoms occurred. Except for brief intervals of an hour, or a few hours or so, *a large proportion of the cases of ectopic gestation pursued their usual vocation during the non-tragic stage* without material or prolonged interruptions.

"*When any woman after puberty and before menopause who has menstruated regularly and painlessly, goes four, five, six, eight, ten, fifteen to eighteen days over the time at which menstruation is due, sees blood from the vagina differing in quality, color, quantity, or continuance from her usual menstrual flow, and has pains, generally severe, in one side of the pelvis or the other, or possibly in the hypogastric region, ectopic gestation may be presumed.*"

The two symptoms of greatest value are:

(*a*) Atypical menstruation, or metrorrhagia.

(*b*) Pains.

The expression "atypical menstruation of ectopic gestation" directs attention to the appearance of blood generally out of rhythm with the normal menstrual cycle of the individual. The amount of blood lost may be very much greater, or very much less, than the usual menstrual flow of the patient. It may be continuous or appear with interruptions. It may be darker or may be lighter or more brownish than the usual menstruation.

The metrorrhagic blood of ectopic gestation very often has a sort of slippery character, almost sufficient at times to diagnosticate ectopic gestation by the effect of such discharge upon the tactile sense.

History.—1. Note if the patient's present or last menstruation was atypical.

2. Note the date, duration, amount, and character of the menstruation preceding the atypical menstruation, and of the menstruation before that one too.

3. Note the date of each colic or series of colics, and the date or dates of any recurrence.

If the patient has been accustomed to painful menstruation, analyze the character of her dysmenorrhea, and ask her par-

ticularly if the pains which appeared in connection with the blood at this time were the same as the usual pains of her dysmenorrhea. If the patient is intelligent, she will at once say that she never had pains like these, and she will at once tell you wherein the pains and the flow of her present attack differ from her previous and painful menstruations. Morning sickness and enlargement of the breasts, which are the ordinary symptoms of intrauterine pregnancy, do not belong to the symptomatology of extrauterine pregnancy. If, with a diagnosis of miscarriage, the patient is still bleeding and has pains, be slow to accept such a diagnosis, unless a fetus has actually been seen by some one.

If the colics are very severe with steady pains between them, the abdominal walls may be rigid. The colics in the beginning of tubal pregnancy are often mistaken for intestinal pains. They may not cause the patient to rest more than momentarily from her work or pleasure. In other cases the pains are so severe and agonizing that the doctor is at once sent for, whatever the time of day or night. Soreness of the abdomen may pass off in an hour or less after a severe ectopic gestation colic, or it may be so prolonged as to prevent the patient from walking for a day or two, or longer. Occasionally jars of the body in walking, or being much upon the feet, cause so much pain that the patient remains in bed for a while. In such cases the colics may return after shorter or longer intervals.

Sometimes colics and the atypical menstruation of ectopic gestation appear before the menstruation is due, or just at the time that it is due. Such a history is rather unusual, and in the absence of tragic symptoms, such as a rapid and weak pulse, fainting, and pallor of the skin, may offer very little presumption of the true condition present until a sufficient time has elapsed to find whether the menstruation is of the usual type for that individual.

Colics and the sharp pains of ectopic gestation are generally closely attended by the appearace of a bloody discharge from the vagina.

The Non-tragic Stage.—In this stage of ectopic gestation the pulse usually remains about normal. If, however, within a few

hours a sufficient quantity of blood is lost in the abdomen, the pulse will be found quickened, the patient weakened, and the temperature below normal, and the amount of blood thus lost to the circulation may be sufficient to at once cause alarm or imperil life. If so, the tragic stage has been reached.

The temperature of the patient in the non-tragic stage of the disease, like the pulse, is not materially affected, unless a considerable amount of blood has escaped into the peritoneal cavity. In that event there sometimes occurs, a few days after extensive bleeding in the peritoneal cavity, some elevation in temperature, generally not more than a degree or so. It should be said that the symptoms of the non-tragic stage may be present for days or weeks before any considerable amount of blood is found in the abdominal cavity. During all this time the temperature may not be materially altered from the normal.

The Tragic Stage.—The tragic stage of the disease is exemplified by severe colics, pallor of the skin, weak and rapid pulse, a fall of temperature one, two, or three degrees below normal, rapid breathing, fainting, generally vomiting and restlessness, and sometimes a lethargic condition from which the patient may be aroused. In this tragic stage the pulse may be anywhere from 120 to 180. It may not be possible to count it at the wrist, although its flickering may be perceived until shortly before death.

Physical Examination.—No disease produces in the pelvis such a variety of conditions to be palpated by examining fingers and hands as does ectopic gestation. Ectopic gestation always increases, in a slight degree at least, the size of the uterus. It is exceptional for the uterus to become very much enlarged. The cervix is generally not altered by tubal pregnancy, but this rule has some exceptions. Most uteri of ectopic gestation are not very materially altered in size, shape or consistency, from the non-pregnant condition. Unless hematocele has formed, the mobility of the uterus may not be particularly affected. If the uterus is lifted by the examining finger, pain is almost always produced on the side of the pregnant tube.

In the non-tragic stage the pregnant tube is usually sufficiently large to be palpated, and possibly also approximately measured by bimanual palpation. Operation in the non-tragic

stage of the disease may show the tube at its largest diameter to not exceed one-half of an inch. The tube may so enlarge from the growth of the fetus within it, and from hemorrhage between the fetal membranes and the tube wall, as to increase its diameter to two inches or more. The tube may become distended from hemorrhage within it, without any considerable amount of blood reaching the peritoneal cavity, and the patient may consequently not yet exemplify the symptoms which characterize the tragic stage of the disease.

A pregnant tube is always tender when squeezed, and may be extremely painful when so traumatized. The tube may be embedded in blood-clots, or so displaced, or partly or completely engulfed in hematocele, that its form and size are indistinguishable.

If a large hematocele has formed, the uterus may be carried far upward and almost out of the pelvis. When thus lifted it is generally pushed to the opposite side from that in which the tubal pregnancy exists. The hematocele may be so large and the uterus so far pushed up that the cervix will with difficulty be reached by the index-finger per vaginam.

The corpus and fundus uteri resting on the outer and anterior surface of a large hematocele may be distinctly palpated through the abdominal wall. In one instance the uterus was visible as it rested upon a large hematocele and lifted the abdominal wall.

Differential Diagnosis.—The following are some of the conditions from which tubal pregnancy must be differentiated:

(*a*) Uterine abortion. (See pp. 786, 882, 883.)

(*b*) Salpingitis.

(*c*) Uterine polyps and submucous and interstitial fibroid of the uterus.

(*d*) Cancer of the uterus.

(*e*) Ovarian cyst with twisted pedicle.

(*f*) Progressive intrauterine pregnancy accompanied by metrorrhagia.

Salpingitis.—A quite common result of salpingitis is shortening of the intermenstrual term and a lengthening of the menstrual flow, with increase in the quantity of blood lost at menstruation.

It is not at all unusual for a patient with acute salpingitis to have a lengthened menstruation, and to have it followed for a number of days by metrorrhagia. If by the time such a case is first seen the initial fever of her infection has passed, and the temperature has returned to normal, the physician may wrongly conclude that her symptoms are those of the non-tragic stage of tubal pregnancy.

If the salpingitis has existed for months or years, the patient may have suffered from pelvic pains, and such a history will of course arouse suspicion, for she may present the symptoms of salpingitis, to which, in consequence of ectopic gestation, are added the symptoms of the latter condition, or she may have only the former disease.

The patient with chronic salpingitis rarely goes over her time of menstruation. If there is any change in the length of time from beginning to beginning of menstruation, it is more likely to be shortened, while the duration and amount of the flow are increased.

Salpingitis disposes many women to menstruate ahead of time; ectopic gestation apparently delays the last or alleged menstruation, and when it appears it differs in one or several particulars from the previous menstruation of the individual.

A very considerable percentage of women who have tubal pregnancy are found, when operated upon, to have diseased tubes. Therefore, in a certain number of the cases of ectopic gestation there are two symptom-producing factors, namely, salpingitis and pregnancy within a tube.

I believe that not very gross pathologic changes accruing from salpingitis constitute the chief, if not the only, cause of ectopic gestation. If this be true, then a certain percentage of cases of tubal pregnancy will exhibit to a certain extent the symptoms of salpingitis together with the symptoms of pregnancy within the tube.

The failure to always differentiate tubal pregnancy and salpingitis is of little consequence, for the reason that in either case an operation is undertaken in the interest of the patient, and while the abdomen is opened the pathologic mass can be removed.

Uterine Polyps.—Uterine polyps produce menorrhagia and metrorrhagia, but they are not prone to produce colics. Intrauterine fibroids cause menorrhagia and metrorrhagia, and to a certain extent pains, which might be mistaken for the slighter colics of tubal gestation, but none of these conditions arising from neoplasm are very likely to produce the severer colics of ectopic gestation.

Carcinoma.—Cancer of the uterus is not always productive of pain, but when it produces pain as well as metrorrhagia, the history may be quite like the history of non-tragic stage of ectopic gestation. The physical examination and finding a painful tube or tumor at either side of the uterus, together with inspection of the cervix, eliminate doubtful points in diagnosis.

Ovarian Cyst.—Ovarian cysts with twisted pedicle cause atypical menstruation and produce metrorrhagia. The excruciating colics, the steady pain, the soreness of the abdomen, and the metrorrhagia which so often follows the twisting of a pedicle, afford one of the best counterfeits of ectopic gestation. Such cases are, of course, comparatively rare, and are not difficult to diagnosticate, unless the tumor which is twisted on its pedicle was not known to exist prior to the colics and to the atypical menstruation.

Metrorrhagia without abortion may occur for two, three, four, or five weeks in the earlier course of *progressive intrauterine gestation.* The absence of colics, and possibly the presence of morning sickness, the very soft condition of the cervix, a gradually enlarging uterus with no special pain at either side of it, make the diagnosis.

The **treatment** of ectopic gestation is abdominal laparotomy as soon as the diagnosis is made, provided the patient is not in too profound a state of shock from the sudden loss of great amounts of blood. These extreme cases, which constitute a small percentage, are operated on immediately by some, an intravenous saline solution, or better still, a blood transfusion, being given before or during the operation. Such cases should be tided over the state of shock by repeated hypodermocylsis, absolute quiet, elevation of the foot of the bed, and not too energetic cardiac stimulation for a period of

twenty-four hours to several days, when the operation is sure to be better tolerated. During this period the patient should be under the closest observation. After operation, conservative treatment and a long period of sterility are essential to avoid ectopic pregnancy in the other tube, if its condition did not warrant removal at the time of operation.

DISEASES OF THE OVARY

Interstitial Oöphoritis.—Interstitial oöphoritis may be acute or chronic. The acute inflammation is chiefly caused by a septic or gonorrheal infection and causes a well-marked small-celled infiltration of the interstitial tissue with hyperemia and increase of the vessels. Extravasation of blood into the tissue may result, and if at the same time there is an entrance of pyogenic bacteria, pus forms. Suppuration involves either all the tissue, the pus changing the entire ovary into a large abscess cavity (ovarian abscess) by breaking through the walls of the follicle, or else the suppuration is confined to individual parts. In this way there results suppuration of the corpora lutea and the formation of corpus luteum abscesses (Abel).

In the chronic form of interstitial oöphoritis there results the formation of connective tissue with sclerosis; the follicles are destroyed and the stroma shows fibrous connective tissue.

It is unquestionable that the diseases of childhood may be responsible for chronic alterations in the structure of the ovaries. Infectious diseases like typhoid are likewise a cause of structural alteration. Intraperitoneal conditions, however, are a very frequent cause of isolated ovarian involvement. The peritoneal irritation and peritoneal exudation associated with milder or more severe degrees of appendicitis or of tuberculosis result in infection of the follicles and in interstitial inflammation of the ovaries. Upward extension of inflammation from the uterus in the gonorrheal infection of children and in the sub-acute upward extension of gonorrhea or other inflammation in adults, either through the tubes or through the broad ligaments (paraoöphoritis) is a frequent cause of ovarian involvement with or without the production of adhesions, especially after curettage. In such cases there are often single or multiple Graafian follicle cysts or tubo-ovarian cysts. (See Ovarian Dysmenorrhea.)

Cystic Changes.—Cystic ovarian changes may be due to retention of fluid in the Graafian follicles or corpora lutea, generally as a result of ovarian inflammation or of infection of the follicles. They may be due to inflammatory changes which involve the tube and ovary, resulting in the formation of a tubo-ovarian cyst. They may be due to proliferating changes occurring in the epithelial components of the ovary as a result of growth of the epithelial elements of the Wolffian body originally present in the formation of every ovary, thus producing cystadenomata. They may be due to the displacement of fetal cells, resulting in the formation of a dermoid cyst. In addition, there are the so-called solid tumors of the ovary.

Retention Cysts.—Retention cysts originate, as a rule, in consequence of chronic inflammatory changes in childhood or later. Through the resulting hyperemia there occurs a serous exudation from the vessels and an effusion of serous fluid into the follicles. In advanced cases the greater portion of the interstitial tissue may be replaced by cysts. The cysts, as a rule, attain the size of a ripe Graafian follicle. The lining of the follicles plays only a passive rôle. Interstitial oöphoritis is the most frequent cause of follicle cysts. The ovary contains numerous follicles of various sizes. Retention cysts, then, are inflammatory cysts and there occurs a "cystic degeneration" of the ovary, often associated with visible disease of the tubes and with mild adhesions. This condition is generally bilateral. The entire ovary is distended and its surface is irregular. If the condition continues, one follicle may overtop the other, may cause them to atrophy, and result in the formation of a large Graafian follicle cyst.

Graafian Follicle Cysts.—Large Graafian follicle cysts begin either as a single cyst or else one cyst of the inflammatory, cystically degenerated ovary grows excessively, overtops the others, causes their atrophy, so that finally there results a cyst the size of a walnut up to the size of a child's head, consisting of only one chamber with smooth lining, and containing a clear fluid, and with an extremely thin, almost transparent wall and lined by cuboidal cells. Part of the ovary is generally retained at the hilus.

Corpus Luteum Cysts.—Corpus luteum cysts vary in dimension from the size of a large walnut up to the size of an orange, with a thick wall and a yellow or brown irregular lining. Corpus luteum cysts are said to occur under circumstances which are not yet understood. The cyst contents originate through serous exudation. They are probably due to infection of a ruptured follicle and have the same origin as some of the retention cysts.

Tubo-ovarian Cysts.—Large follicle cysts with a hydrosalpinx form a tubo-ovarian cyst. Tubo-ovarian cysts are therefore inflammatory cysts of the ovary combined with hydrosalpinx. The abdominal end of the tube is attached to and is adheren to the ovary. The ovary is dilated into a large unilocular or multilocular cyst by infection of the follicles. Such tubo-ovarian cysts are situated posterior to the broad ligament and are often fixed far over to the lateral wall of the pelvis, and are exceedingly adherent to the floor of the pelvis and to the sigmoid flexure. They often become so closely attached to the posterior wall of the broad ligament that they seem to be situated within the folds of the broad ligament, and are therefore pseudo-intraligamentous. They are often double-sided, in which case there is a vast difference in their size and development; one side usually being much smaller, less adherent, and much less developed than the other.

Parovarian Cysts.—Parovarian cysts are unilocular cysts with a thin wall containing a clear fluid, situated within the broad ligament and therefore intraligamentous. Upon the external surface is found a long straight tube and a portion of the ovary. They develop from the parovarium, which is situated in the hilus of the ovary in the mesovarium.

Proliferating Ovarian Tumors.—Proliferating ovarian tumors are tumors of active growth developing from epithelial structures situated within the ovary. These tumors have been said to develop from the Graafian follicles or from the surface epithelium of the ovary. However, they probably develop from remnants of the Wolffian body situated in the ovary. They are of two forms:

1. **Glandular Cystoma.**—Cystoma glandulare or cystadenoma pseudo-mucinosum, containing watery, honey-like, or

jelly-like contents. Even the watery fluid has a sort of syrupy, sticky consistence. Because the inner lining shows glandular proliferation it is called cystoma glandulare or cystadenoma. Because the contents contain pseudo-mucin, and because the contents are sticky, even if watery, and often of honey-like or jelly-like consistence, the name cystadenoma pseudo-mucinosum is given.

They all contain pseudo-mucin. The wall of the cysts consists of an outer layer of germinal epithelial nature; that is, of the outer structure of the ovary. The middle layer consists of connective tissue; the inner layer consists of epithelium. Microscopically there are cavities, and tubules lined with epithelial cells of high cylindrical character which have nuclei at the base. The epithelium projects in microscopic papillary form into the cyst cavity.

These tumors are the most frequently observed form of ovarian cysts. The tumors are of various sizes, from small cysts to extremely large ones. The entire ovary is involved. Usually there is a main cyst and many smaller cysts, but the outer surface is formed by a common capsule. The surface is smooth if the cyst is composed of one chamber. The surface is irregular if the tumor is composed of several chambers. The form is ovoid or spherical, but sometimes when multilocular it is irregular. The smaller tumors may feel firm and hard, but the larger ones have a cystic feel. These tumors are generally unilateral and pedicled. They may be adherent to omentum and intestine.

Cystadenoma pseudo-mucinosum is the most frequent form and produces the largest tumors. They are generally found between the thirtieth and fiftieth years. Unmarried and sterile women are especially disposed.

Metastases may occur with cystadenoma pseudo-mucinosum. There may occur jelly-like tumors with very thin walls in the peritoneal cavity. If a cystadenoma pseudo-mucinosum ruptures spontaneously or at operation, there may occur such cystic jelly-like tumors in various areas of the peritoneum, which condition is called pseudo-myxoma peritonei.

2. **Papillary Cystoma.**—Cystadenoma serosum or cystoma papillare. They are called cystadenoma because of the

epithelial proliferation. They are called cystadenoma serosum because of their thin, clear, fluid contents. Because of the papillary epithelial growths on their inner surface they are also called papillary cystoma. This form is generally multilocular and they contain no pseudo-mucin. It is characterized by papillary growths, in that on the cyst lining there are projections formed of epithelium, ciliated in character. The entire cyst may be lined with papillary outgrowths of the character of a cauliflower. The cyst may be filled with such masses. The tumors may be of any size, up to that of a man's head. They have an irregular surface. They are often bilateral and not rarely intraligamentous. *They often cause ascites.* Through energetic epithelial growth, the epithelial masses penetrate the wall and extend up to the peritoneum. They are therefore malignant. These cysts are dangerous because the papillary excrescences have marked tendency to grow through thewall of the cyst. Therefore these tumors are often adherent and the papillary growths produce peritoneal metastases of the same character. When the papillary excrescences perforate the cyst wall, ascites is frequent and the tumor constitutes a malignant process. The early metastases of papillary tumors, however, may disappear after removal of the original tumor.

Dermoid Cysts.—Dermoid cysts are cysts varying in size from that of an egg to that of a child's head. They contain fat, epidermis, hair, bone, teeth, etc., and on microscopic examination be found to contain muscle tissue and various forms of glandular tissue. They often feel hard or solid, and are generally adherent.

Teratoma is really a solid dermoid containing the same variety of tissues, with the exception of hair and epidermis. Therefore they are not cystic, but are solid.

The origin of dermoids is to be referred to fetal cells displaced into the ovary by the Wolffian body in the course of embryonal development.

If ectodermal cells are displaced to any extent, so that their presence is manifested by cutis-like tissue, hair, sebaceous glands, etc., they are called dermoid cysts. If the displaced cells are, so to speak, located in one part of the organ concerned, and if they grow equally, and if the skin cells, as in the normal

skin, and the sebaceous glands, excrete their products, a cystic dermoid must result. Since the contents found in dermoid cysts are excreted by the so-called "derm" of the cyst, they must lie, when secreted, between the derm and the enveloping tissue composing the organ or tissue in which the dermoids grow. The larger the amount of secretion, the greater is the pressure exerted on the surrounding tissue. If the mass of secreted matter reaches a fair amount, and if it causes a tissue growth in its periphery, and if it distends the enveloping organ or tissue so that it is stretched and flattened, there results a cystic dermoid whose wall consists of so-called "skin," of granulation tissue, and of the tissue of the enveloping organ. The original group of displaced cells are conspicuous only in one part of the so-called cyst, in which are formed the hair, the sebaceous glands, and the other elements present on the inner surface of a dermoid cyst. The greater the amount of substance secreted, and the greater the amount and number of products formed by the displaced ectodermal and mesodermal cells, the larger is the cyst.

If, on the other hand, the displaced cells are not grouped in one part of the organ concerned, and if, at the same time, the ectoderm cells are not present in too great number, there develops a tumor in which the various forms grow into each other. Since the ectoderm cells do not form in such a case a so-called "derm," and since they cannot bring about the formation of a cyst through sebaceous excretion, as above described, a tumor form results which is relatively solid and which seems to be of an entirely different structure—a so-called "teratoma."

The so-called "mixed tumors of the ovary" are the following: enchondroma and osteoma, which are rare; cystic sarcoma, myxofibroma, adenomyxocystoma. In comparison with the mixed tumors of the testicle they are rare. A comparison of the mixed tumors found in the ovary with those in the testicle shows that in the latter there is a prevalence of mesoderm products with a relatively infrequent presence of ectoderm elements. In the ovary, however, these tumors occur more frequently in the forms of dermoid cysts than in the testicle. This may be explained by the fact that in the female the Wolffian duct and the

Wolffian body lie at the hilus as non-functionating organs, while in the male they form the vas deferens and functionating tubules.

That enchondromata and osteomata occur frequently in the ovary seems to be overlooked, because these, almost without exception, occur in combination with ectoderm cells, *i. e.*, as dermoid cysts and solid dermoids. This difference is explained, as above, by the fact that the Wolffian body and duct in the female remain as regressive structures and are more liable to growth on their own part and on the part of the cells which they have displaced. On the other hand, the Wolffian duct in the male forms the vas deferens, and a portion of the Wolffian body forms the head of the epididymis and the rete testis, while only a part undergoes regressive changes, and this part has not, like the Wolffian duct, been in close contact with ectoderm.

In ovarian dermoids and teratomata, ectoderm is present. Therefore teeth are frequently found, and their occurrence is in contrast with their rarity in the testicle.

In dermoid cysts the teeth are embedded in bone, or in the wall of the cyst where no cartilage or bone is to be found; they may also lie in the cyst contents. Their number varies, even one hundred or more having been found in the cyst. The teeth lie, as a rule, on the inner surface of the cyst, and are rarely embedded completely within the wall; another fact which speaks for their origin as explained above, for ectoderm or skin is found on the inner surface. A further interesting fact is that the teeth, in all cases which we have examined, are always unilateral, and, with perhaps one exception among eleven cases which were examined by a skilled observer, correspond to that side of the body in which the cysts are found, *i. e.*, in right-sided cysts were found right-sided teeth; in left-sided cysts, teeth of the left side. The occurrence of teeth in dermoid cysts is not limited to the ovary alone, for they are found in dermoid tumors in the brain, the eye, the mediastinum, and in abdominal dermoids. The teeth may be either first or second teeth, and both forms may be found in the same tumor. They may be molars, bicuspids, incisors, etc., and may represent the teeth of the upper or lower jaws.

The dermoid cysts of the ovary do not always take their origin from the ovary. If, however, they do, the ovary may be entirely dilated by the tumor which has developed in it. On the other hand, the ovary may be found only in one part of the cyst wall in cases where the dermoid cyst originated at the hilus and grew into the broad ligament. Dermoid cysts may develop in the broad ligament and the ovary takes no part in the formation of the tumor, but lies absolutely free, showing, however, as a rule various changes.

The cells from which dermoid cysts develop may be carried into other parts of the ovary, so that several dermoids are present. Olshausen found in one case a proliferating cystoma of the ovary with a dermoid cyst of the size of an egg. In another case he found three dermoid cysts side by side. Wilms reported a case where five small dermoid cysts were present in one ovary.

Dermoid cysts of the ovary frequently contain, in addition to epidermis and hair, smooth muscle fibers, cartilage, bone, teeth, connective tissue, neuroglia cells, structures like spinal ganglia, and cysts. The latter may be lined with simple or stratified cylindric epithelium or with ciliated epithelium. The inner surface of the cysts may show papillary excrescences, or may be lined with crypts containing beaker cells. In other words, in these dermoid cysts the same glandular structures are found microscopically as are found in the various adenomata, cystomata, and cystadenomata of the ovary, whose origin is referred to the Wolffian body tubules.

Among other interesting structures found in dermoid cysts must be mentioned nails (finger-nails), of which very fine specimens are to be found in the museum of the Anatomical Institute of Vienna. Olshausen says: "It should not be considered strange if nails belonging to the skin are frequently found in dermoid cysts. The collection in the Gynecological Clinic in Halle contains a specimen of a dermoid cyst of a goose containing a large number of feathers."

Dermoid cysts are frequently combined with proliferating cystomata. As a rule, a cystoma is found in the same ovary in addition to a dermoid cyst, but more frequently there are found

in the walls of the dermoid cyst smaller or larger formations of the same character as in simple proliferating cystoma. These two forms are to be distinguished from these combinations of two separate tumors, the one a dermoid, the other a cystoma, united through adhesion and perforation of the separating walls. The occurrence of a dermoid in one ovary with a cystoma in the other is by no means rare. Olshausen quotes a case of Flaischen in which a proliferation of the connective tissue was present in the same ovary; the walls of the cyst showed sarcomatous degeneration. A case of Unverricht showed, in the left ovary, the characteristic elements of a dermoid, and also red, spongy masses which were included as distinct nodules in the connective-tissue capsule. The case presented a round-celled sarcoma. Tumors of the same form were found in the cervix, peritoneum, omentum, liver, and diaphragm. Although the tumors in these latter situations are to be considered metastases, that in the cervix probably originated from the Wolffian duct, in the same way as the main tumor in the ovary. That dermoids and teratoma should form metastases and undergo malignant degeneration into carcinomata, etc., is very natural, for they are nothing else but the cells of the patient, and may, therefore, pass through the same changes as the normally situated cells of the body.

Solid Tumors.—The solid tumors of the ovary are fibroma, sarcoma, true carcinoma, papilloma, endothelioma, and teratoma. With myoma or malignant tumors of the uterus the ovaries are hyperemic and edematous. In ovarian fibroma the ovarian tissue is replaced by fibrous connective tissue. The external form of the ovary is usually preserved. Such changes are most often observed with uterine myomata. Myomata of the ovary are rare, and when they occur are usually mixed tumors. They are generally round-celled and of soft consistence. Papillomata are solid tumors of the form which also occurs when the cyst wall is perforated by the papillary growths in the cyst with papillary cystomata. Carcinoma of the ovary has an irregular surface, early ascites, many adhesions, and peritoneal metastases. No sharp clinical distinction is made by most surgeons between pure carcinoma and solid papilloma.

DIAGNOSIS

In *chronic oöphoritis* the ovary is rarely larger than a hen's egg. It is sensitive and other inflammatory evidences may be present. In making the diagnosis of chronic oöphoritis, the ovary must be felt to be structurally altered and to be painful and sensitive on pressure. Care must be taken not to include in this class an ovary containing a Graafian follicle about to burst, which gives on the first bimanual examination evidences of an enlarged sensitive ovary. Repeated examinations must show an ovary to be definitely altered. Small cystic degeneration is evidenced by a hard, tense feel and an irregular surface. In the smaller cystic conditions of the ovary the cystic consistence is generally lacking. Such an ovary is found only on careful bimanual examination. It may be situated in the normal location of the ovary, but very often it is posterior to the uterus or situated in the cul-de-sac of Douglas. These smaller conditions are of various sizes and are with or without adhesions. This change in the ovary is often the cause of ovarian dysmenorrhea, of intermenstrual ovarian pain, pain felt in the hips, the thighs, the back or under the ribs.

An *intraligamentous cyst* is situated in the broad ligament close to the uterus, extending up to the pelvic wall. When large it bulges down into one lateral fornix. It has a rounded upper surface and has little mobility. The uterus is often pushed away from the median line. A pseudo-intraligamentous cyst is a retroligamentous tumor fixed to the floor of the pelvis and to the broad ligament, which is situated on its anterior and upper surface. The anterior surface of the cyst is often so closely attached to the broad ligament as to make the tumor seem intraligamentous.

Intraligamentous cysts are of limited mobility. They cannot be pulled or pushed out of the pelvis. They are situated close to the uterus. The folds of Douglas are situated median to them and posterior to them; while in retrouterine tumors the fold of Douglas is anterior to the tumor. With intraligamentous tumors the connection of the cyst with the uterus is thinner than the beefy connection of an intraligamentous myoma. Intraligamentous cysts must be diagnosed also from pseudo-

intraligamentous tubo-ovarian tumors, from intraligamentous hematoma, etc.

Ovarian tumors must especially be distinguished from pedicled myomata. Ovarian cysts have a cystic feel, but are often hard; especially is this the case with dermoid cysts of the ovary. In order to identify the pedicle, the tumor should be pushed up into the abdominal cavity and the uterus pulled down by volsella. As a rule, ovarian tumors have a thin membranous pedicle, while fibromata have a thicker, rounder, and more solid pedicle. If with a cystic tumor two normal ovaries can be palpated, the diagnosis of pedicled fibromyoma is made.

With *ovarian cysts of large size* a differential diagnosis must be made from encapsulated ascites due to tuberculosis, from the ascites of carcinoma, from a distended bladder, and from peritoneal exudate. The main point is to feel a pedicled connection with the uterus. The uterus should be pulled down by tenaculum forceps to make the pedicle tense and an assistant should pull the tumor upward. Then with one or two fingers introduced into the rectum the external fingers should meet the fingers situated in the rectum between the uterine horn and the tumor. In this way the pedunculated character of the tumor and the character of the pedicle can be made out. The horn of the uterus on the side from which the tumor comes is less movable than the other one. Diagnosis is aided by percussion, by palpation, and by inspection of the abdomen. In encapsulated ascites there is not such a round contour and nodules may be felt. A tympanitic resonance may be obtained as a result of the adherent intestine situated over the encapsulated fluid, and there is a less clearly outlined tumor than is the case with ovarian cyst. *A distended bladder is excluded by the use of the catheter.* Echinococcus cyst usually shows an associated involvement of the liver. Pregnancy of the fourth or fifth month, especially if the uterus is anteflexed, demands a differential diagnosis from ovarian cyst. The portio seems separated from the fundus by the area of Hegar and the portio may be mistaken for the uterus. By examination through the vagina and through the rectum there must be proved a continuation of the portio into the pregnant fundus. If the fundus of such a pregnant uterus is situated laterally,

it resembles an intraligamentous cyst. The history of amenorrhea, morning nausea, the evidences of ballottement, and bluish discoloration of the vagina are points of importance. Often these cases must be watched for weeks until fetal movements and the beating of the fetal heart in the second half of pregnancy make the diagnosis of pregnancy absolute. The only doubt at this period is produced by those cases of pregnancy with dead fetus. Under such circumstances the sound may be used.

In the *very large tumors* of the ovary a differential diagnosis must be made from obesity and meteorismus. A real diagnosis between free ascites and ovarian tumor is often made only at operation. It is eessntial to prove the pedicled connection with the uterus. In free ascites the abdomen is more flat, the lateral borders of the abdomen are prominent, and the center of the abdomen is more flat. Cysts produce a projection in the middle of the abdomen, while the lateral borders are flatter. In ascites the percussion note in the lower part of the abdomen is dull, while it is tympanitic above. With increase of the ascites the horizontal line of delimitation between the dull area below and the tympanitic area above extends upward above the umbilicus until finally the tympanitic note is entirely lost, if so much fluid is accumulated that the interstitial mesentery is too short to permit the intestines to come near the abdominal wall. Ovarian tumors produce a dull note in the center and a tympanitic note laterally. An important diagnostic point is found in the fact that even if ascites gives a dull note on percussion, yet percussion with the fingers pressed deeply into the abdomen will give a touch of tympanitic resonance. In ascites if the hands are placed on the lateral borders of the abdomen and tapped gently, a wave of fluctuation toward the other side is produced. Alterations in tympanitic resonance are produced by changes of position. If tapping is done, ascitic fluid has a specific gravity of 1010 to 1015.

A very difficult diagnosis is that of *ascites associated with ovarian tumors*. When the ascites is due to papilloma, no diagnosis can be made without puncture and draining of the abdomen. after which the papillomata may be felt and disseminated

nodules may be made out throughout the entire abdominal cavity.

Twist of the pedicle in the case of ovarian cyst produces pain and increases the size of the tumor as the result of hemorrhage. There is a local peritonitis, which with gangrene of the cyst may become a general peritonitis. Adhesion to the intestine and omentum occurs early.

Malignant ovarian tumors have hard irregular surfaces, are often double-sided, and produce ascites. Ascites is not always a sign of malignancy, for it may occur with glandular cystoma, with fibroma ovarii and fibrosarcoma of the ovary, and with papilloma. With malignant ovarian tumors there is cachexia, the tumor is firmly fixed to the surrounding structures, and hard disseminated nodules can be felt in the upper abdomen.

Treatment.—Palliative treatment is of no avail, and if the symptoms or size of the mass require treatment, the cysts must be removed by operation.

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